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INDIA and PAKISTAN in the WORLD

by
EVA D. BIRDSEYE

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INDIA AND PAKISTAN IN THE WORLD

HOLY FAMILY
Girls' Primary School
Krishnagar-Nadia

By

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INDIA AND PAKISTAN IN THE WORLD

CHAPTER I

THE WORLD AS A GLOBE

IN this book we are going to read many things about our country and some things about some other countries in the world. But before we begin let us think about the best way to use the book. Some boys and girls like to have everything done for them, so that when they open a book they think all they have to do is to read it through, a chapter at a time; and more or less learn it off by heart. They may pass their examination that way, but it's a dull method of working and I think people who use a book like that generally forget most of it before long. There is a better way; one that is more interesting and one that will help you to remember all your life what you have learnt. Geography tells about the world in which we live, the people with whom we live and the different ways in which people live in different parts of the world and since we all have to live in the world it is worth remembering what we learn in Geography, isn't it?

If you want to get the most out of this book then, always read it with your atlas open in front of you and never read the name of a place, or a river, or mountain without finding it in your atlas at the same time. You will find that there are quite a lot of questions in the book, not put at the end of the chapter for you to work out for home-work, but right in the middle of the text. Usually you will find the answer to them too, for I want you to be able to use the book for revision afterwards, but when you read it first and you come to a question, try to answer it for yourself, before you see what the book says. It will be far more interesting that way and you will find that you can remember it much better. Sometimes you will find suggestions for things to do. Do them before you read any further and you will find that you understand the rest of the chapter more easily.

Latitude and Longitude. Now let us see what we mean by two long words which you must have met before:—Latitude and Longitude. Suppose that someone asked you which was your desk in the class room, how would you answer? You would probably say something like this:—" It's the fourth one from the left in the third row from the front," wouldn't you? Before you could say exactly which was yours, so that someone else would be able to find it without a mistake, you had to have some fixed lines from which to count your desks. In this case it was the left-hand wall of the room and the front row of desks.

If you want to tell a stranger how to get to your school, how would you do it? Take the third turning on the right after you pass the Post Office and the school is the second house on the left. What are your fixed points this time?

Now suppose that you want to find a town on the map, let us say Timbucktoo, how will you do it? Perhaps some of you know that it is in Africa. Would you open the map of Africa and look all over it till you found the town? That is one way but it is not the quickest. The best way is to look in the index at the back of your atlas and find its Latitude and its Longitude, then turn to the map of Africa, see where these two lines cross each other and there you will find your town in a moment.

What are Latitude and Longitude then? Fixed lines drawn on the globe from which we can find the position of any place we wish. That is one answer, and perhaps the most interesting for us; but there are other people to whom latitude and longitude mean a great deal more than they do to us. Can you say who they are? Sailors, who must be able to find their way over seas with no land in sight for weeks; explorers who are searching for new ways across the snows round the Poles, and airmen flying high above the clouds. All these people have no fixed points like the Post Office and street corners from which to take their direction. They must find their way by some other means. Let us try to see how they do it.

Look at the globe and find the line marked Equator. You will see that it is drawn exactly halfway between the North Pole and the South Pole. You will probably see too that it is marked 0° at some point. Parallel to it you will find other smaller circles. (See Fig. 1.) Find out what their numbers are. They will differ on different globes because some times there are more lines than others, but you will find that the Pole is always 90°. How did these lines get their numbers?

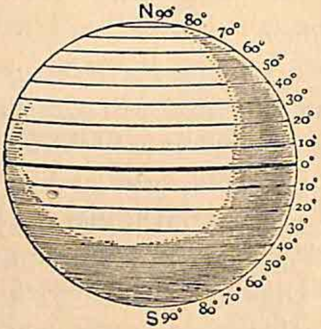

Fig. 1

The Earth is a globe, or sphere, and to measure distances on it we must measure in circles. The easiest way to measure along a circle is not in miles but in degrees. If you have ever tried to measure a curved line you will know this. The best way to understand how the degrees of latitude are measured is to draw some for yourself on a ball. This is one way to do it.

Get a small rubber ball about 3″ diameter, if you can afford a solid one so much the better. Take a piece of thread and measure the circumference round the joint, which you usually find on a ball of this kind. Divide your thread in two and mark the points where the two ends touch the circle. These two points will be the Poles. Find the radius of your ball by dividing the distance between the

Poles by two. The easiest way to do this is to run a knitting needle through your two poles and mark the position where the needle cuts the ball. Then take out the needle, divide the distance between the marks by two.

Next take a piece of cardboard, draw a circle with the radius you have just found, and another concentric circle, *i.e.*, one with the same centre but with about an inch longer radius. Draw a diameter. Make an angle of 30 degrees at the centre. Mark it 30° at the circumference. Then make an angle of 60° and then 90° and mark them as before. Your cardboard should then look like the diagram below.

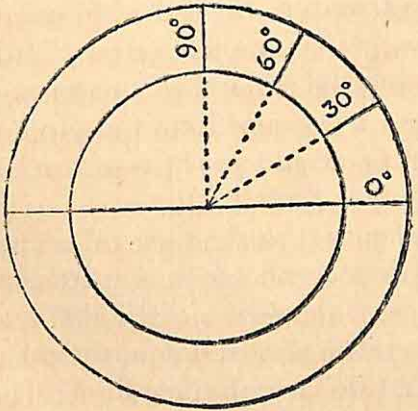

FIG. 2

Look at your inner circle. If you mark the diameter 0° you can call it the Equator and you can call 90° the Pole and then you will have divided the quarter of the circle between them into three equal parts. You could just as easily have divided it into 9 equal parts by making your angles 10° each instead of thirty or even into 90 equal parts, but that would have given you too many lines on your figure.

Now cut out the inner circle. Put the knitting needle through the poles of your ball and rest the ends on two large books, so that you can turn the ball freely. Now fit the circle of cardboard on to your ball. Put your pencil on the ball where the 0° is marked on the cardboard and turn the ball slowly. You will find that a circle is drawn on your ball. What is it? Do the same thing with the points marked 30° and 60°. You will then have three circles on your ball. What do you notice about their size? What are their names? Any point on your first circle will be on the Equator, any point on your second circle will be 30° away from the Equator and any point on your third circle will be 60° away from the Equator. Call the 90° point, the North Pole. Now you have three lines of Latitude drawn on your globe North of the Equator and if you wanted to explain the position of any point on your first circle you would say it was Lat. 0° and on your second it was Lat. 30° N.

Now turn your ball round so that the other end of the knitting needle lies over the point marked 90°. Put your pencil against the points marked 30° and 60° and draw these parallels as you did on the other half of your ball. What do we call these lines? The South Pole is now at the point marked 90° and these two lines lie between the South Pole and the Equator so we call them 30° S. and 60° S.

Do you now understand a little about why we talk about degrees of Latitude? Perhaps you are asking how do sailors find their way across the sea, and explorers across the snows, and airmen through the clouds by means of latitude; for of course you know that we cannot draw lines over the earth itself and still less over the sea. We will try to answer this question now.

Determination of Latitude by the Pole Star and by the Sun. From very early times people who lived near the sea and those who lived near great deserts watched the sky by day and night. They found that the sun and the stars seemed to move in an orderly way and they were able to use them for finding their way when there were no landmarks to guide them.

They noticed that at night there was one star which always appeared in the same place. Others moved round, but this one which we call the Pole Star, came up every night at exactly the same spot. This gave them one fixed place from which to take their direction. To-day, Scouts and Guides are all taught to find their way by this star. We know now that it shines straight down on the earth at the North Pole.

If we could go to the Pole we should see this star immediately above our heads, that is in the zenith or 90° above the horizon. As we travelled back to India we should see that the star seemed to be lower in the sky every night and if we went as far as the Equator we should find that it was exactly on the horizon itself. This means that at the North

Pole the Latitude is 90° and the Pole Star is 90° above the horizon; at the Equator the Latitude is 0° and the Pole Star is 0° above the horizon. From this you can see that if the Latitude is 28° as it is at Delhi, or 25° as it is at Karachi, or 13° as it is at Madras, the Pole Star will be 28° or 25° or 13° above the horizon, as the case may be. So if we can get an accurate instrument for measuring the angle between the Pole Star and the horizon we can find our latitude. (See Fig. 3.)

All ships carry such an instrument and for all places North of the Equator they can find their latitude this way. Why is this no use South of the Equator? There are other stars by which the latitude can be measured there but it is not quite so easy to understand as there is no star exactly over the South Pole.

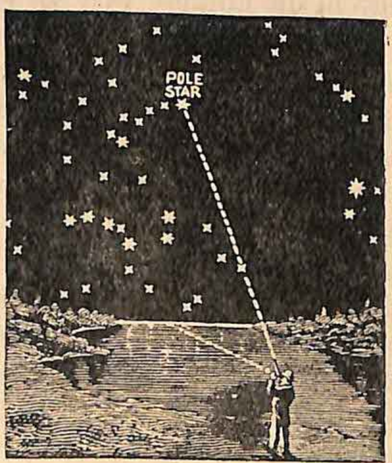

FIG. 3

But sometimes sailors want to know where they are by day as well as by night. How do they find this out then? They use the sun. You know that the sun appears to move from East to West across the sky during the day and that at noon it reaches its highest point above the horizon. If we measure the angle between the sun and the zenith (the point immediately overhead) at the moment when it is highest in the sky, we can find the latitude of any place. Ships carry very accurate instruments by which they can measure this angle and if you are travelling on a large vessel you will see an officer come and mark the "noon position" on the chart a few minutes after 12 o'clock each day.

It is not quite so simple to find latitude by the sun as by the Pole Star, because the sun seems to travel between the Tropic of Cancer and the Tropic of Capricorn during the year, but ships carry tables of figures which enable them to allow for the amount North or South of the Equator that the sun has reached each day.

On March 22nd and September 22nd the sun at noon is in the zenith at all places along the Equator. At the North and South Pole it is at the horizon, that is 90° from the zenith. Between the Poles and the Equator, the noon position of the sun gets higher in the sky until it reaches the zenith itself. This means that if we measure the angle from the zenith as we said, we find that at Latitude 90° the sun is 90° away from the zenith and at 0° (the Equator) the sun is 0° from the zenith; so that the latitude of any place is the same as the sun's distance away from the zenith at noon.

Between March 21st and June 20th the sun is in the zenith at noon at some place between the Equator and the Tropic of Cancer; if we know exactly where this place is we can easily find our latitude, wherever we happen to be. For example; suppose a ship is at sea and finds that on a certain day the sun at noon is 50° from the zenith. If it is March 21st the captain of the ship will know that he is in Lat. 50°. If it is somewhere between March and September he looks at his Nautical Almanac to see what the "declination of the sun" is, that is how far North of the Equator the sun is, and if he finds that it is 5° he adds 5° to his 50° and decides that his ship is in latitude 55° N. If however it is between September and March and the sun is South of the Equator and the captain finds that the declination is 5° he must subtract 5 from 50 and will decide that his ship is in latitude 45° N.

Longitude. Now let us turn to that other word Longitude and see if we can find out what it means. Look at your globe again and find the circles passing round it through the poles. These are called meridians or lines of longitude. The word meridian comes from a Latin one meaning mid-day and these lines pass through all the places which have midday at the same moment. When we were talking about the lines of latitude, we said that the one mid-way between the poles was the largest and that we called it the Equator. That was easy to find but if you look carefully you will see that all the meridians are of the same size so it is difficult to choose one as a standard. When we want to find the exact position of a place on the globe we say that it is so many degrees away from the Equator N. or S. as the case may be and so many degrees East or West of Greenwich. Greenwich is a place near London where there is a great Observatory. One Meridian had to be chosen as the Standard from which all the others could be named and as much work on the size and shape of the earth had been done at Greenwich, the circle which passed through this place was chosen as the Standard or Prime Meridian. (See Fig. 4.) This one is called 0° and the rest are numbered in order 1° to 180° East and 1° to 180° West.

These lines are spaced by angular distance just as the lines of Latitude are. You can draw them for yourself on your ball by taking the knitting needle out and placing it through the Equator from side to side instead of through the Poles. Then rest the ends of the needle on the cardboard ring as before and put your pencil at each of the angles in turn and spin your ball. You will find that all the circles are the

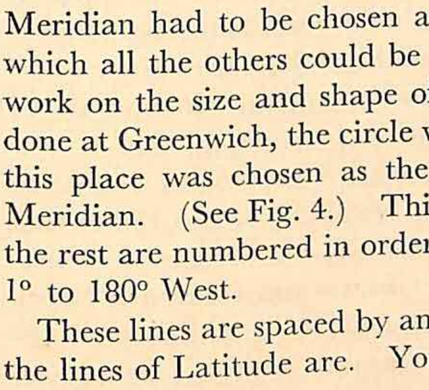

FIG. 4

same size and that they all pass through the points which you have already marked as the Poles. Mark one of them 0° then the others will be 30°, and 60°, and 90° East of 0°.

Look again at your large globe and notice that only half the circle is called 0°, the other half is 180°. This is because we measure both ways round the globe from the Prime Meridian. The easiest way to understand this is to take your globe and count for yourselves 10, 20, 30, 40 degrees East of Greenwich, 10, 20, 30, 40 West of Greenwich till you find that 180° East is also 180° West. You can now name the other halves of the meridians that you have drawn on your small ball. They will be 30 East and 150 West, 60 East and 120 West, 90 East and 90 West. Try this for yourselves.

You can now see how to fix the position of any place on the globe. Where do India and Pakistan lie? The farthest point North is about 37° North of the Equator and Cape Comorin is about 8° North so the whole of these countries lie North of the Equator and stretch about a third of the way from the Equator to the Pole. This is important because of the effect on their climate. If you now look at the longitude you will see that from furthest East to furthest West, India and Pakistan stretch from Longitude 61° to 96° East, about 37° in all. How many degrees are there at the centre of any circle? 360. So there must be 360 degrees of longitude. 180° East and 180° West of the Prime Meridian, You need not remember the exact figures but it is important to realise that India and Pakistan cover a very large area and that it is all comparatively near to the Equator.

Longitude and Time. We said that Meridian meant Mid-Day and perhaps you are wondering why we use this term. You all know that the earth turns round once in twenty-four hours and that because of this turning we get day and night. If you are not sure about this, one way to see it is to put your needle through the Poles again. Then take your ring of cardboard and slip the ball into the hole so that the edge of the cardboard fits along the Prime Meridian. Now light a candle and put the ball in front of it. The half of the ball which is facing the candle will be light, while all that lies on the other side of the cardboard ring will be out of the rays of the light from the candle.

You can imagine that the candle is the sun, though you must remember that the sun is very much larger than the earth and very far away from it. Now turn your ball through a few degrees but keep your cardboard ring still. What happens? The Prime Meridian moves towards the light while the 180 Meridian moves equally quickly into the darkness. When the Prime Meridian was just at the edge of the cardboard ring it was sunrise for all places along it. Turn the ball just half way round, the Prime Meridian will be having noon, and will be exactly opposite the flame of the candle, while the 180 Meridian will be having mid-night and be also in line with the rays of the candle but on the other side of the world.

If you turn your ball still further round, another meridian comes opposite the candle flame and then the places along that meridian will be having mid-day; turn it still further and another meridian gets mid-day until, if you turn it far enough, you find that the meridian 180 gets mid-day. What is happening to the places on the Prime Meridian now? They are having mid-night, are they not?

You can now see that all the places on one meridian have mid-day at the same time and also that places on different meridians have mid-day at different times.

Through how many degrees does the earth turn in 24 hours? 360°, doesn't it? Then through how many degrees does it turn in one hour? 15°. What does this mean? If you live anywhere on the Prime Meridian you will have your noon when the clock says 12 o'clock, but those people who live on the meridian of 15 degrees West will have to wait a whole hour before they get their noon. The ones who live on the meridian of 15 degrees East will have had their noon a whole hour before you get yours.

Local Time and Standard Time. Now let us look at conditions in our own country. If you live in Madras will you get your noon before or after the children who live in Calcutta? After, because you live further west. How much later? Calcutta lies on the meridian of 88½° E. and Madras on the meridian of 79½° E. and therefore there is a difference of 9° of longitude between them. For each degree of longitude there is a difference of 4 minutes in time so you will be having your Noon 36 minutes later than the children in Calcutta.

Twelve o'clock mid-day is always called Noon. When it is 12 o'clock in Madras the local time in Calcutta will be 12-36 or 36 minutes later than the time shown by the clocks in Madras. What about the clocks in Karachi? This town is west of Madras and so gets its Noon later still. It is about 12 degrees further west so it will get its Noon 48 minutes later than Madras. This means that when the clocks in Madras say 11, those in Calcutta should say 11-36 and those in Karachi should say 10-12.

How confusing this would be. Find the longitude of your own town and try to see what the difference in Noon-Time would be between your home and some of the great towns in India and other parts of the world. The noon shown by the sun like this is called local time. If you are on board ship the local time is always taken at Noon, when the position of the ship is found as we said earlier. Then the ship's clock is altered and everyone on board goes to see what the time is and changes his watch accordingly.

This is quite simple on board ship for everyone on board keeps the same time. No one needs to catch a train or go to school, and if the meal times are fixed they can be fixed by the ship's clock and everyone has to come when the bell goes. But supposing every place in India kept Local Time. What would happen? If you were going from Bombay to Calcutta you would leave at 8 o'clock at night say, but Calcutta gets its noon before Bombay, so that when you arrived at Calcutta you would find that your watch said 9 o'clock instead of ten. You would be late for all your appointments if you went by the time on your own watch. Think how confusing this would be. If you went to another town it would be worse still for the difference in time would not be the same and you would never know how much fast or slow to count your watch. To avoid this difficulty we have agreed to have one Standard time for the whole of India. We have chosen as the Noon for the whole country the time when it is noon on the meridian about half way between the East and the Western margins. You can find out what the difference in time is between Standard Noon and Local Noon like this:

Choose a post at least six feet high; a badminton post will do quite well if it is not too shaded by trees. Go out about 10 o'clock and mark the position of the shadow of the post. Tie a piece of string round the post and a stick at the other end of the string which should be the exact length of the shadow. Now draw a circle round the post with the string as the radius.

Go out again about 2 o'clock and watch carefully until the shadow falls again on the circle. It will be the other side of the post this time. Now measure the distance between the two marks showing the ends of the shadow. Divide this distance by two and mark the point on the ground. Draw a line from this mark to the post. This shows the direction of the shadow at noon. To-morrow go into the compound about 12 o'clock and watch the shadow of your pole until it lies along this middle line which you have drawn. Then look at your watch. When the shadow lies along this line it will be noon according to the sun.

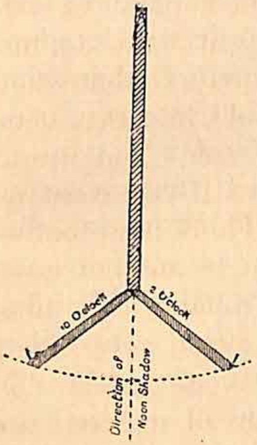

FIG. 5

This is noon at your meridian, but unless you happen to live on the Standard Meridian, it will not be exactly 12 o'clock by your watch or the school clock. If you are living to the East of the Standard Meridian it will be some time after 12 and if you are living to the West of the Standard Meridian it will be some time before 12. It will not be many minutes each way. In Madras it is

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about 10 minutes after 12 by the clocks when it is local noon by the sun.

We live in a large country but even so the difference in time from East to West is only about one hour. This means that people living in East Pakistan have Local Noon about half-an-hour earlier than those living in West Pakistan and therefore they have chosen a different Standard Time, just one half-an-hour earlier than that of India and West Pakistan. In some countries, such as North America, the difference is as much as five hours. This means that if the sun says it is noon at New York it would be saying that it was only 7 o'clock in the morning at San Francisco. Even if they had a Standard Meridian half-way across the Continent, from which they took their time it would mean that it would really be 2-30 when the clock said 12 at New York and 9-30 when it said 12 at San Francisco. You can see that this would not do at all. The difference between Standard time and Local time would be too great. What do they do then? They have five belts of time across the country with five Standard Meridians. All the places within each belt keep the Standard time of that belt and when a train passes from one belt to the next it has to change its time. The engine driver and the guard put their watches back four times as they pass from New York to San Francisco and forward as they come the other way. You may think that this is troublesome. It is, but it is less confusing than having to keep one Standard time for the whole country.

Try to answer the following questions and see if you have understood what we have been saying.

SUGGESTIONS FOR PRACTICAL WORK

1. If you were travelling from Bombay to London would you have to put your watch forward or back each day?
2. If it is 12 o'clock at Delhi what time is it at Aden? Shanghai? London? New York? Chicago? (You can find the longitude of all these places in the index at the back of your atlas.)
3. If you are travelling across the Pacific Ocean from Yokohama to San Francisco you have to cross the International Date Line. Find this in your atlas. Ask your teacher to explain what this is and what happens when you cross it.

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CHAPTER II

THE TOPOGRAPHICAL MAP

MOST of the maps which you have used so far have been either large Wall Maps or small Atlas Maps, but now we are going to spend a little time in learning to read a large scale map. This shows you much more about the country than the others can do. This kind of map is really a picture of a small piece of country but because it is so very small in comparision with the country which it represents, and because there are so many things which the map-maker wishes to show, he has to use special symbols for the different things found in the country-side. If you learn to read these symbols you will be able to see the country in your mind's eye as if you had really seen it or walked over it. It is worth while spending some time over this for it will be useful to you all your lives and need not be just an exercise in geography. The only way to do this is to get several maps and work at them until you feel that you really know what the country looks like, no book can help you very much but we will try to give you a few hints to set you on the right path.

First of all get a one-inch map of your own town or village and as many more of different scales as you can and compare them. A One-Inch map is one in which one mile on the ground is shown by one inch on the map and this is the most generally useful of the large scale maps. You can get a half-inch map and a quarter-inch one and, in large towns, other kinds as well, if you are fortunate you may get a 25 inch map, and in places like Calcutta or Karachi you can get special town maps made to a scale of 3 inches to the mile.

The Scale of a Map. Having got as many different kinds of maps of your own districts as you can, find out first all you can about the scale. In one corner of the map, [or at the bottom if it's a one-inch one], you will see Scale one inch to one mile or 1 : 63360. Sometimes this last part is written as a fraction like this $\frac{1}{63360}$. It is called the Representative Fraction because it shows us the relationship between the distances on the ground and on the map. If it is a one inch map, for every mile on the ground one inch is used on the map and since there are 63360 inches in a mile the map is exactly $\frac{1}{63360}$ of the actual size of the country shown.

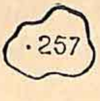
If you can get a 25 inch map you will see that the Representative Fraction is larger, 1 : 2534·4 because instead of only one inch showing a mile of country, 25 inches are used to show the same distance. Two things follow from this. *Firstly*, if you must use 25 inches to show the same distance in one map as you were able to show in one inch in the other, the 25 inch map cannot show nearly as much country on the same sized sheet as the other one.

Secondly, since there are 25 inches to show one mile, ever so many more details can be shown on this map than on the one inch one. The 25 inch map will show separate houses, while the one inch one can only show a whole village as one red block of buildings, many more names can be shown in the larger scale map and it is a good exercise for you to compare the two and make a list of the extra things which you can tell from the 25 inch map. Similarly if you compare the quarter-inch map with the one-inch one you will see that in this one 4 miles are shown by one inch, so a much larger area of country can be shown on one sheet but the amount of detail will be much less. Different kinds of maps are made for different purposes but the most generally useful is the one-inch map and we shall talk about this for the rest of the chapter.

The One-Inch Map. If you were going to describe some country which you had seen on your last holiday; so that the friends to whom you were talking would get a good idea of what you had seen, how would you begin? The most important thing is to make sure that they understand whether it was hilly country or flat, near the sea or inland; and if it was hilly country whether the hills were easy to climb or difficult. If you had been there it would be easy for you to tell about it but if you really know how to read a map you can tell almost as well as if you had seen it. Always begin your study of the map by finding out whether it is hilly or flat country. To be able to do this you must know the symbols used to show hills and valleys.

Contours. All heights are shown on the One-Inch map by means of **Contours.** These are brown lines which are drawn to show land which is of the same height above sea-level. Look at a map of your own district and find one of these lines. You will see that some brown lines are darker than others and if you look carefully you will discover that each line is 50 ft. higher than the one before it and that every fifth line is darker in colour. If the country is comparatively low you will need to take notice of the pale brown lines, but if you are looking at a map of the country round Darjeeling or Mahableswar or Ootacamund, say, you only need to notice the darker lines which are 250 ft. apart. You can think out the reason for this for yourselves.

One of the first things which you wish to know about a hill is how high it is, and that is easy to find out. You will sometimes see figures like this on your map ·257, or ·3236. These are called *Spot Heights* and they show the exact height of the spot which is marked with the ● Quite close to the first one you would look for the dark brown line marked 250, would you not? It would most probably look something like this and near the second one you would look for the pale brown line showing all the country which was 3,200 ft. above sea-level. There are many



ways by which you can help yourselves to understand hills and their contours, but the simplest is to get permission to dig in an old garden bed. Make several differently shaped hills and draw lines round them at equal heights above the level of the bed. Call these contours and then draw them on a sheet of paper. You will soon learn to describe the ones you see on the map if you do this.

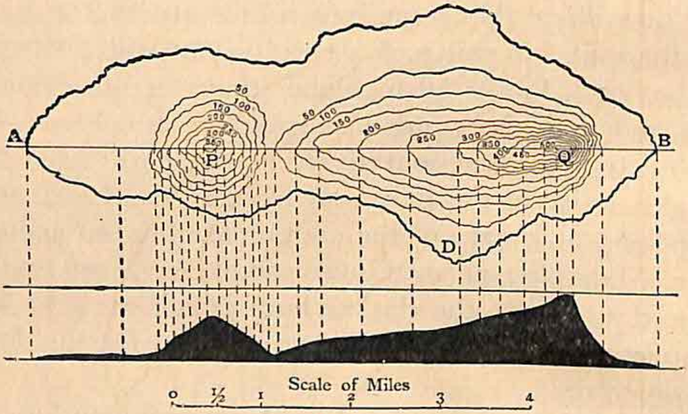


Fig. 6

Steep and Gentle Slopes. The next thing to do is to find out whether the hill is steep or gentle. If you have experimented in the garden bed you will probably have made some steep hills and some gentle. If you have looked carefully, you will have already found out for yourselves that a steep hill has its contours closer together than a gentle one.

If you see on your map a hill with contours like this, you will be able to describe it at once in some such words as these:—" There is a hill in the North-West of the area which is 359 ft. high. It stretches

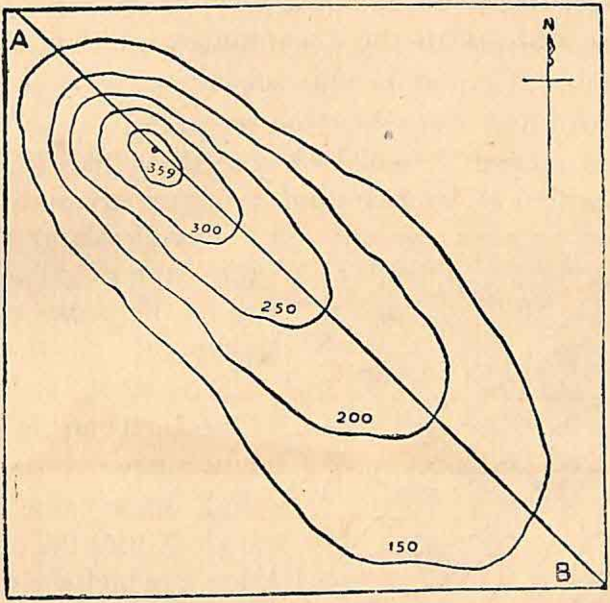


FIG. 7

from North-West to South-East and has a steep slope on its North-Western side but a much gentler slope on its South-Eastern side." (See Fig. 7.)

Valleys and Spurs. Sometimes we get isolated hills, especially in South India, and they can usually be described something like the one shown in Fig. 7; but in many other cases the hills are not separated from one another, but form part of a plateau which has been cut up into spurs and valleys by numerous streams. What do the contours look like which can be drawn round these highlands? Again the easiest way to understand them is to dig in the garden bed and invent a plateau for yourself, then take some water and pour it on to the top letting it flow where it will, then draw the contours at equal heights above the garden bed. You will find that when you try to draw your map of the plateau it will look something like Fig. 8. Notice that all your contours point up stream in the river valleys and down the slope of the spurs which lie between the valleys.

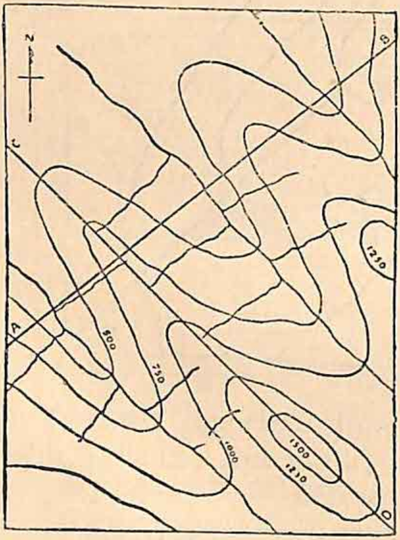
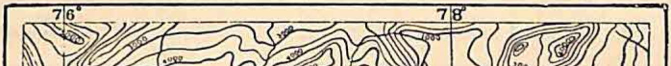


Fig. 8

Now look at your One-Inch map and see how many river valleys and spurs you can find. Notice the direction in which the main rivers flow, which will give you the general slope of the land, so that when you are trying to describe the country shown on your map the description will be something like this: "The country shown on Fig. 8 is a plateau about 1,500 ft. high which has been cut up into valleys and spurs by streams, which flow from South-East to North-West. The tributary valleys are steep and the streams flow into the main rivers almost at right angles." Sometimes a river flows at the bottom of a deep gorge and then the contours will be close together and the two sides of the valley will be almost if not quite parallel to one another for several miles. (See Fig. 9.) Look again at your one-inch map and see if you can find such a valley. You will often see a waterfall at the head of the gorge.



Note The Contours below 1000 ft have been calculated at 200 ft apart taking the Coast line at 0 and those above at intervals of 500 ft

FIG. 9. Contour Map of Part of India

Vegetation. When you have found all you can about the relief of the land shown on your map, you can look for other things, but always begin with the relief; for most of the human geography of the country depends on it. The one-inch map of the

Indian Survey tells you a great many things that are interesting about the country. Look next to see how the land is used. If there is a good deal of high land it will probably be coloured green, at least in parts. This means that it is wooded or forested. You can then picture your hill-sides covered with small shrubs, trees and grass, with perhaps more trees in the valleys than on the hill slopes. Sometimes you will see a darker green line round a certain area and R.F. inside it. This means that this country belongs to the Government and is Reserved Forest. If you can go to see some forested land in your next geography expedition take your map with you and see for yourself what the country looks like. If you have seen one such area it is much easier to picture others which you have not seen.

Crops. Look once more at your map and see how the lowland is used. It will most probably be coloured yellow or left blank. The yellow colour means that the land is cultivated. If that is so, try to imagine what the crops grown will be. If there is a good water-supply it will most likely be rice. You cannot tell for certain but it is worth while trying to picture what the country looks like. See if there are many tanks in the area. If they are coloured blue it means that there is water in them all the year and you can be fairly certain that near them the land will be used for growing paddy. The nearly straight black lines which stretch out from the tanks are irrigation channels, so you can use your imagination again and picture these channels full of water supplying the paddy fields around the tank. Sometimes the tanks are not coloured blue but left white. That means that they are only full of water in the wet season. You can see that the land irrigated from them will not be able to grow as many crops as that irrigated from the ones having water all the year round. If you look carefully you will probably see some small blue dots. These show where there are wells. The most likely crops on this land will be dry crops.

Look once more at your map and see if you can find any particular kind of tree marked. There are special symbols for coconut trees, betel fields and plantain trees. These will help you again to describe the crops grown. You will probably see the palmyra tree symbol on most of the tank bunds and if your map includes part of the sea coast, the casurina topes will be very clearly seen.

Sometimes the land is left white with perhaps some special symbol showing grassy scrub on it. This means that the area is not cultivated but waste land. Picture sheep and goats feeding on the thorny grass and try to find a reason why this land is too poor to be cultivated. Think of its position; if it is close to the sea it may be too sandy or too salt, or if it is on the side of a steep hill it may be too steep to hold vegetation on it, or it may even be so far away from water of any kind that it is impossible to cultivate it. Near the sea coast, especially, you will sometimes see *salt-pans* marked; land which is covered by the tide at certain times and from which the water having evaporated, salt is left.

Communications. The next thing to look for is your means of communication. People sometimes look for these first and begin their description of the map by saying how many roads and railways are to be seen. You must remember that the land was there long before man began to make roads and railways across it, and so if you are to give a reasoned explanation of what you find you must begin at the beginning with the relief. The chief thing that you need to know about the roads is where they lead and why they were built there. On flat country it is not always easy to explain their direction. They seem to wander about all over the land with no particular purpose, and then you must suppose that the villages are older than the roads and that these have been built to link one settlement with another.

The most interesting kind of map on which to study communications is one which shows hills and valleys that are difficult to cross. The roads will always be built along the easiest gradients and you can find much interest in working out exactly why the roads or railways follow the particular lines shown. Remember that it is often worth while to build a longer road if the slope is easy than to build a short one which goes straight up hill. This is specially true of railways. If large rivers have to be crossed the road will make for a bridge or ford. If the beds of rivers are inclined to be marshy the roads and railways will be built some distance away from the stream. In really hilly country all the tracks will be found to follow river valleys as the easiest means of crossing the high land.

Railways came late in India and Pakistan, and it is sometimes necessary when explaining the direction which they take to look at the larger settlements. It does not pay the railway company to take a line through small villages where there are not enough people to use it. They will therefore make a longer line to take in large towns. This is sometimes not easy to see on a large scale map since only a small portion of the line is shown. If you cannot find any reasonable explanation of the direction of the line crossing your sheet, look up the area in your atlas and see whether the line is really passing from one large town to another not shown on your sheet.

Position of Towns. The last thing to look for in your map is the position of the towns and villages, and you can have a most interesting time trying to explain their exact position. If the country is hilly you will find a settlement where two roads, coming down separate valleys, meet; or where a tributary valley meets the main one. Another likely spot for a village will be where a road crosses a river, especially if there is a bridge. The head of a delta, as it is the last place where a bridge can be built across the main river, is a specially likely place for a settlement. In the plains it is not always quite so easy to explain why a town has come to be built where we see it on the map but if you think carefully you can usually find a reason.

When you have looked carefully at your map with these suggestions in front of you it should be easy to describe any country under the following headings:—

1. **Relief, position and direction of the highland.** Type of highland, isolated hills, dissected plateaux or ranges of hills with longitudinal valleys in between.
2. **Drainage.** Main direction of the rivers and their tributaries. Type of valleys.
3. **Vegetation.** Natural vegetation, forests or scrub or marsh. Crops likely to be found.
4. **Means of communication.** Type and main direction of the roads. Direction of the railways.
5. **Settlements.** Position of the chief towns and large villages. Relation between relief and settlement.
6. **Population.** Only a rough idea of the type of population and the occupation of the people is possible but it is quite possible to say whether the settlements are rural or urban and the likely occupation of the people.

SUGGESTIONS FOR PRACTICAL WORK

1. Make in sand or garden mould models of different types of hills. Draw maps of these. (Clay or plasticine may be used.)
2. Cut a section across the model and then draw the section. (See Fig. 6.)
3. Draw a section across the lines A, B and C, D shown in the Figs. 7 and 8.
4. Look at any O. S. map available in your school but preferably of your own District, and describe as carefully as possible, (1) the drainage, (2) the Settlements and (3) the relation between these Settlements and the relief, drainage and means of communication.
5. Describe as carefully as possible the O. S. Map of the school district under the headings shown above.

N. B.—It is essential that as much of this work should be done out of doors with the maps in the hands of the pupils if possible.

If the school is situated in a hilly district it is often worth while to trace off the main contours, get the map so formed duplicated and give one to each pupil while the first part of this chapter is being worked.

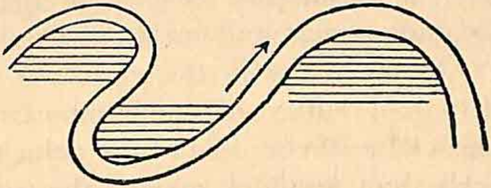
CHAPTER III

RIVERS

WHEN rain falls what happens to it? Next time that a shower falls in your school compound try to see. Go outside and notice that at first most of the water sinks into the ground. After a short time the earth gets soaked. When the earth can take in no more the water begins to collect in small streams. If the ground is flat these wander about in winding curves over the surface till they reach the lowest part of the compound or the side of the road. If you look carefully you will be able to see most of the stages of a river in your own compound.

The Work of a River. The little stream which you see does three kinds of work. First it carries the mud washed into it by the rain, which is called *transportation*. Then it cuts a bed for itself in the ground, this is called *erosion*, and finally it drops both the mud washed into it by the rain and the stones and gravel and sand it has carved out of its bed, somewhere along its course. Most of it is dropped at the end. This work is called *deposition*.

If you can go to see a larger river near your school, you will probably find that there is a place where one bank is steep. You will see smaller streams, or places where streams ran during the last wet weather, running down into the main river. Here the bed of the tributary stream is deep, for the water ran swiftly. The faster the water flows the more work it can do. Before it reaches the main stream it will probably have to cross a small stretch of flat land. Find such a place if you can and notice that there is a little pile of sand and stones at this point along the side of the tributary stream. When the water was flowing down the steep bank it could carry a much heavier load than when it reached the flat ground and so dropped some of it where the current was not so swift.



☰ *Sandy Patches*

Fig. 10

Look now across the main stream and you will probably see that opposite the steep bank there is flat sandy ground, with perhaps grass and a few bushes growing on it. This is almost certain to be true if the river is curved at this point. Now stand on the bank, throw a twig into the water and watch it float down stream. You will notice that while it is passing round the outside of the curve it moves more quickly than it does round the inside.

We have just learned that if water is moving slowly it can only carry part of its load, so the grassy patch of sandy soil has been made by the silt, which the river has dropped as it moved slowly round the inside of the curve. On the other hand, when it is moving quickly the water can do more work, so on the outside of the curve it has cut the land away and left a steep bank.

Sometimes, after heavy rains, you will find a pool of water standing in your compound. If there is a stream caused by the rain running into it you can often see a young delta being formed. As the running water reaches the pool its speed is checked, so it cannot carry so much sand but drops it as it enters the pool. As the water in the middle is flowing more swiftly than that at the side it can carry more sand. This causes the middle of the delta to grow more quickly than the sides, making the triangular shape which we recognize in all deltas.

The Stages of a River. In nearly all rivers we find three stages. The first or *Mountain Tract* is like the steep-sided gully which you found at the side of the road. In it the water flows swiftly, carrying large boulders and often flows over rapids or even waterfalls. In this stage it is of little use to man unless it can be made to turn a dynamo and so generate electricity. Very often this part of the course is so far into the mountains that it is not possible to get the necessary machinery to the river, so it is seldom used in this way. Look in your atlas and try to measure how much of the Indus and

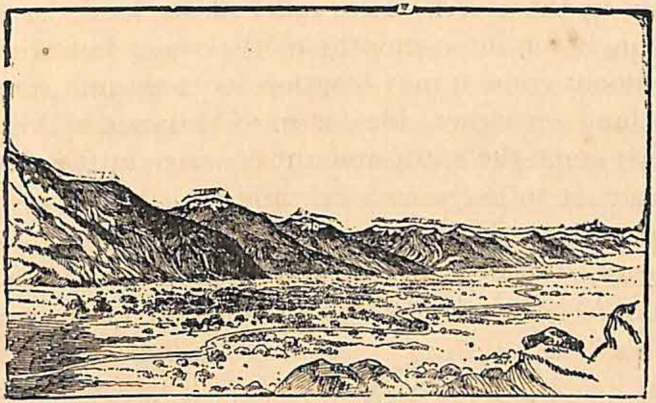


FIG. 11. A Valley Tract

Ganges rivers flow through the mountains and compare it with the length of the river which flows through the plains.

The next stage is the *Valley Tract*. Here the water has been reduced in speed for the bed is not so steep. The river often flows from side to side of its valley but does not occupy the whole of its bottom. In this stage the river is still actively carving out its bed and gradually widening its valley but some deposition is going on, especially on the inside of the curves.

The next stage is the *Plain Tract* where the river is building up its bed and practically all its erosion is finished. This is the most important stage for man's purposes. He uses the new land, built up by the river, for growing his crops and the water from the river for irrigating them. As this is the flood plain it is not always easy to build large towns near to the river. The water flows in its usual channels for some months of the year; but when the floods come it may overflow its banks and cover the land on either side for some distance. When floods come the extra amount of water in the river enables it to do more work and so it often cuts a fresh channel for itself especially across the neck of a bend, if that gives it a more direct route. (See Fig. 12.) This is why you often find backwaters and even lakes in the plain stage of a river. It is quite clear that it would not be a very good place to build a town if the course of the river is constantly changing, so when you look at a map of part of the Ganges Plain, for instance, try to see exactly where the villages are placed. If the river curves very much you will find that all the settlements are placed on the outside of the bend. Why is this?

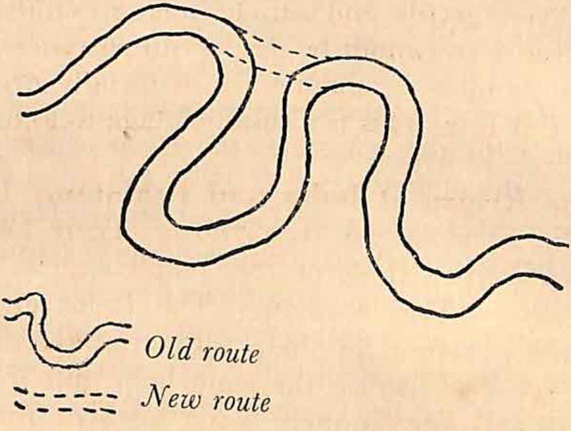


Fig. 12

Deltas. If a river brings down much silt with it, as do most of the Indian rivers, and if there is little or no tide to scour out the mouth of the river, the sea acts in the same way as the pool of water in your compound. It checks the rate of the flow of the water and a delta is built. Here the channels are constantly changing their direction, new land is being built rapidly and the delta is pushed further and further into the sea every year. The land is often very fertile and can be used for cultivation, but the river cannot be used as an entrance to the country, unless a channel is artificially dredged, as at Calcutta. This is a disadvantage to a country. Can you see why?

The Rivers of India and Pakistan. Let us look at some of our rivers now. There are two different types, those of the Indo-Gangetic Plain and those of the Deccan. The Indus and the Ganges and most of their tributaries rise in the Himalayas far above the snow-line, and so they have a constant supply of water in them from the melting ice. This is of very great importance to the people of the great Northern Plains. They have water in the river the whole year round which can be used for irrigation, and even in places for local navigation.

The Rivers of the Northern Plains. The Ganges Plain is very fertile, for the soil brought down by the rivers comes from different parts of the Himalayas and some, though not so much, from the Deccan plateau. The rocks, from which the soil is formed, vary from place to place so that there is a mixture of different kinds of soil ready for the farmer to use.

The Indus is even more important in the lives of the people who live on its banks, for it flows through the very driest part of the country, the land of which would be completely barren without its water. This is led in great channels from large irrigation works to the farmer's fields.

Both these rivers suffer from floods which are sometimes disastrous and cause not only loss of crops but loss of life too. There are two seasons when floods are likely to occur. In the Hot Weather, May and June, the snow on the mountains is melting rapidly; thus extra water gets into the head-waters of the rivers causing them to flow swiftly, carrying rocks and trees along with them to the plains. Here they spread out far and wide on either side of their usual channels and if villages are built too close to the stream they are swept away. Again a little later in the year when the rains of the S.-W. Monsoon are at their highest, much extra water gets into the rivers and floods occur again.

The Rivers of the Deccan. The rivers of the Deccan differ from those of the Northern Plains in that they are not snow fed. Many of them are almost completely dry for nine months of the year. Their beds are great stretches of shining yellow sand, with perhaps a wandering trickle of water somewhere in the middle. Then the rains come in June and July and everything is changed, the river comes down in flood, filling its bed completely. The strangest thing about this is the suddenness of the change, which sometimes happens in a night. They can never be used for navigation for the volume of water changes so quickly. Most of them are used for irrigation. Large dams are built across the bed of the river as at Mettur on the Cauvery. (Fig. 13.) The water which comes down with the rain of the S.-W. Monsoon would all be lost unless it were stored behind the dams. Later in the year when the rain has ceased, the water is released through the gates in the dam and conducted by channels to the fields which need it for irrigation.

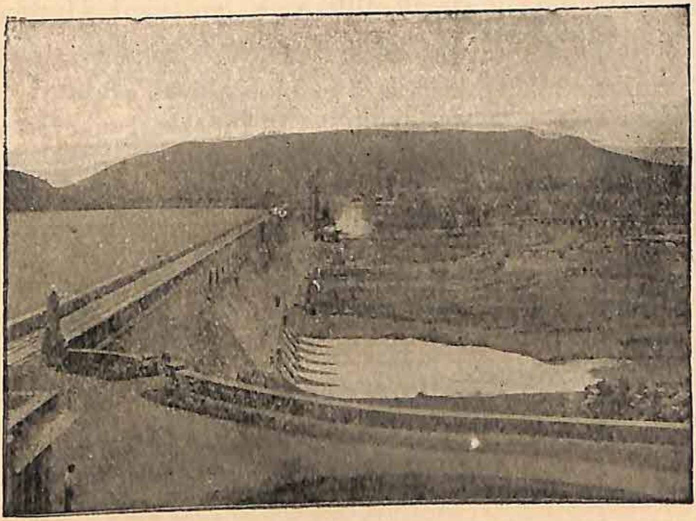


FIG. 13. The Mettur Dam

Hydro-Electric Power Stations. There is another use to which these Deccan rivers are put, they have to leave the plateau by means of waterfalls to reach the Eastern Plain. The Cauvery falls over the edge of the Deccan at Sivasamudram by a drop of 420 ft. Men have now caused this falling water to do some work other than just cutting back its bed. The water is passed through large iron pipes over the side of the gorge and falls on turbines in the Power Station at the foot. The turbines are connected with dynamos which generate electricity. This power is then conveyed, by means of wires, to all parts of the Mysore State where it drives trains, lights towns, works machines in factories and is used in mining gold.

Power produced in this way is called Hydro-Electric Power because the power of the falling water, which can only work in one place, is changed into electrical power, which can be taken wherever it is wanted. There are several more such Power Stations in the Deccan. The largest in the Madras State is at Pykara in the Nilgiris, where the water of the comparatively small Pykara river is used, but the fall is much higher than at Sivasamudram.

The rivers flowing down the Western Ghats into the Arabian Sea are short and swift because the highland is so close to the coast. They carry much water in the wet season but much of it is lost because it cannot be stored for use in the dry weather. Some attempts are now being made to use the water from some of these streams and you will read about one of them on page 100.

Sand-bars. Both rivers bring down a good deal of silt, especially when they are in flood. This is carried out to sea. The currents of the Bay of Bengal flow parallel to the coast, half the year from the S.-W. and the other half of the year from the N.-E. according to the direction in which the prevailing wind is blowing. The sand and mud brought down by the rivers is carried along by the currents, parallel to the coast. Half the year it is swept northwards and the other half of the year it is swept in the opposite direction. This means that it is never carried away from the shore. Therefore, a sand-bar is being built at the mouths of the rivers and the coastline gradually extending Eastwards. You can see the backwaters left behind all the rivers along this coast. If you cannot see them in any other way look at them on the O. S. map of the district for they are very characteristic of the Madras State.

SUGGESTIONS FOR PRACTICAL WORK

1. Trace the course of a stream in the compound the next time it rains.
2. Draw rough sketch maps of what you see.
3. Study the course of part of the Ganges or its tributaries in an O. S. map, looking for changing channels, ox-bow lakes, sandbanks on the inside of the curves.
4. Get the O. S. map of Banaras and study the position of the town and its suburbs with regard to the river.

Notice the position of the Railway junction at Moghil Serai. Why is it not at Banaras?

5. Get some maps of the West Coast and observe the backwaters, sandbanks, at the mouths of rivers, and th smooth curving coastline.

CHAPTER IV

ROCKS

WE have been spending some time on rivers and said that they all brought down sand and silt with them from the hills to the sea. We all know what we mean by sand, because we have seen it in our own gardens or by the seashore. But do we know how it was formed?

Crystalline Rocks. In the early days of this world the outer crust was molten, and as it cooled, the different minerals of which the molten mass was composed, crystallised out and formed the solid mass which we call rock. Sometimes the cooling took place near the surface and then the crystals which were formed were very small. If you try to form crystals in the science room, the ones which come

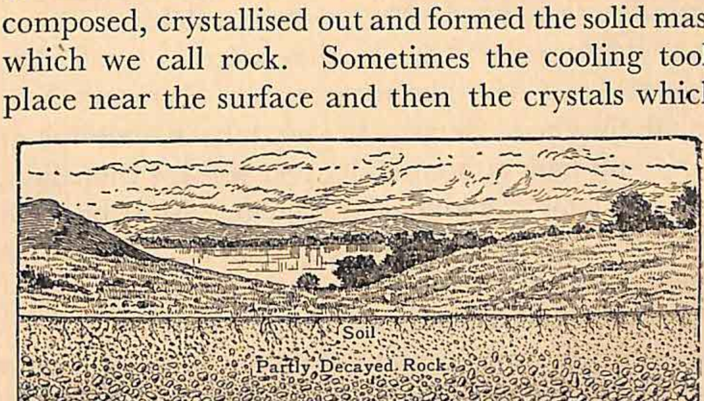


FIG. 14. Section of the Earth's Surface

from a solution which is cooled quickly are much smaller than those which are formed from a slowly cooling solution. But some were cooled below the surface and then the crystals which were formed were much larger. You can see them in any granite which is near your school. Large areas of the Deccan are made up of granitic rocks, so if you live anywhere between Nagpur and Cape Comorin you should be able to find some quite easily.

When the rain fell on the rocks, and rivers began to form, the rocks began to break up. As the rivers grew stronger they were able to break off larger portions of rock and these gradually got broken up into smaller and smaller portions till by the time that they reached the sea they were so small that they did not look like rocks at all. We call these small fragments sand. If you take a handful of sand and look at it carefully you will see that there is more than one kind of fragment. Most of them are hard and greyish white in colour. These are small pieces of quartz. If you compare your handful of sand with the piece of granite which you looked at first you will easily see how the large quartz crystals have been broken up into the grains of sand. There are more of these than of any other in the sand because the quartz is one of the hardest of the minerals. When these come rolling along the river bed they cannot be broken into such small particles as the felspar, which is the pinkish mineral which you see in the granite, or the mica the shining white mineral; though you can sometimes find a few of these particles in your handful of sand.

The breaking up of the hard rocks into smaller fragments is called weathering. A great deal of this work is done by rivers, but rain and wind take their share and along the seashore the waves do a great deal in breaking down the rocks into smaller and smaller particles. The smaller the fragment the lighter it is, and so the further it can be carried. You always find the heavier and larger particles nearer the shore and the finer ones further out to sea.

Sedimentary Rocks—Sandstone. If you could drain away the water from the Bay of Bengal you would find that the bed of the sea was covered with very, very fine sand washed down by the rivers of India and Burma, and broken into smaller and smaller particles by the waves of the sea. The lower layers are pressed closer and closer together by the weight of the newer ones coming on top of them. In time these get cemented together and form a solid rock, and instead of a shifting sandy soil we have a solid sandstone. This takes such a long time that we cannot measure it in years but talk of Geological Ages. We know that this is what must have happened in the far away past, because we find in some places on what is now dry land, sandstone rocks made up of tiny fragments of sand cemented together by a kind of glassy substance. These rocks are different from the ones we talked of at first. They have been made, not by the cooling of the earth's crust, but by the cementing together of fragments broken down from these first or Primary Rocks. There is not a great deal of this kind of rock in the Deccan Plateau, though there is more in the North. the Cuddapah Slabs, which we use in our houses, are a kind of sandstone formed in some such way as we have just discussed. At some time in the history of the Peninsula of India, the part of land sank under the sea and the old crystalline rocks were covered with sand, as we said was happening to-day in the Bay of Bengal. Later the land rose again and then the part which had been under the sea was covered with the Cuddapah Sandstones.

Limestone. Sometimes another kind of rock is formed. If you live near Tiruchirapalli you may have heard of the limestone rock which is found in that area. If you live near Jubbulpore you may have seen the limestone gorge there. This is also formed under the sea from the shells and other hard parts of the sea creatures. These fall to the bottom and the hard parts which are made of calcium carbonate, dissolve in the water and form a cement around large fragments of broken shell and even whole shells which collect on the bottom. When this land is raised above the sea, a Limestone Rock is found covering the area which was submerged. This is one of the most interesting of rocks for it frequently contains the shells of some creatures which lived in the sea, embedded in it. These shells are called fossils and from them we can tell something about the age of the rock.

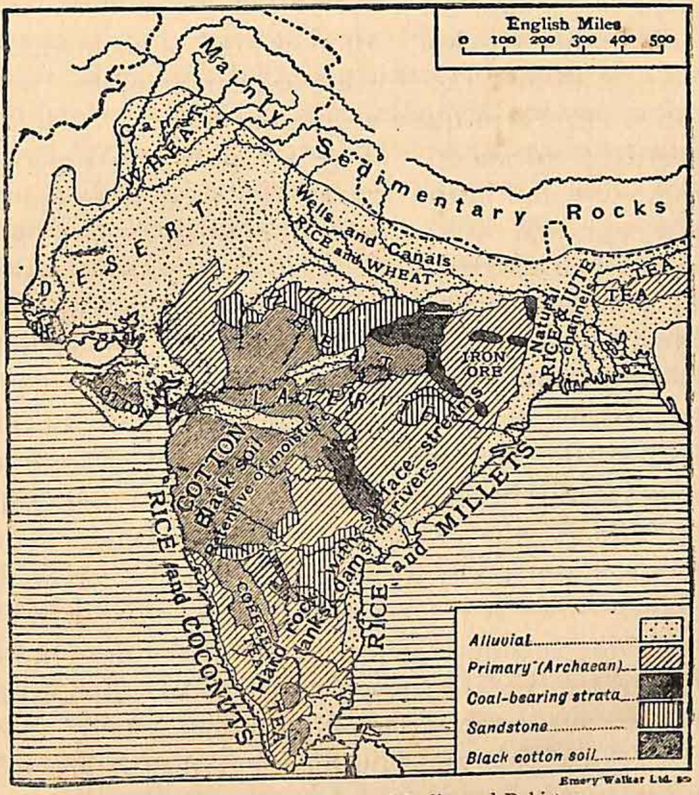


FIG. 15. Geological Map of India and Pakistan

Limestone and sandstone are both called sedimentary rocks because they have been formed from sediments sinking to the bottom of the sea. They are also called stratified rocks because they are usually found in layers, one on top of the other.

There are many kinds of such rocks of many different ages but we do not find many outside the Himalayan region and if you wish to read more about them you should get a book on Geology.

Volcanic Rocks. Another kind of rock which we find all over the North-West corner of the Deccan is formed in quite a different way. You have heard of volcanoes. There are no active ones in India now but in the far past ages there were some. We said that at one time the earth's crust was molten but to-day it has cooled down to solid rock. In some parts of the crust, especially along the Mediterranean and all round the shore of the Pacific Ocean, there seem to be weak places where earthquakes frequently occur. Here the pressure of the crust on the interior of the earth is lessened and the solid interior becomes liquid at that point and wells up through the crack or line of weakness. The rock so formed is molten and is called *lava*. It cools quickly when it reaches the surface and so it does not show crystals. A large part of Western India is covered with such volcanic rock, which was poured out at the surface in past ages. It is called the *Deccan Trap* and you have heard of it because when it weathers it makes a specially rich, sticky, black soil which is good for growing cotton.

Soils—Alluvium. We have talked about rocks and now we must see what we mean by **soils.** When a rock is weathered by rain and wind, or sudden changes of temperature, such as we get in desert regions, it breaks up into finer particles and we call these broken fragments-soil. Sometimes the soil is carried from one place to another by streams and then it is called *alluvium*. The great plains of the Indus and the Ganges, and the deltas of the Deccan rivers, have been built up of such alluvial soil. The coasts of the Peninsula are being built further and further out into the sea by alluvial soil washed along by the currents. Along the East Coast, the shifting sandy soil is being kept in its place, very largely, by the casurina plantations, which are grown for miles along the shore.

The value of any alluvial soil depends on the rocks from which it has been brought. The greater the variety of rock through which the river flows the better the soil, and the less it has to be manured before a crop can be grown. This is partly why the Ganges Plain is so much more valuable, as land for cultivation, than the valleys of the Deccan plateau. The sandy shores of the Bay of Bengal are the least valuable of all.

Laterite. Sometimes the soil is not carried from one place to another but is used on the spot where it is formed. Weathering takes place all the time and the kind of soil that is formed partly depends on the type of rock which lies under the soil and partly on the amount of rainfall. A rock with a large percentage of quartz in it will yield a sandy soil, while one which has more felspar in it will yield a clay soil, and so on. In some parts of the Peninsula there is a peculiar kind of red soil, which contains a very large proportion of iron. It is called *Laterite* and seems to be formed by the weathering of the rock below and not to have been brought from some other place as in other parts of India. See Fig. 14.

We must now see how these different rocks are useful to man in our country. The old, hard crystalline rock of the Deccan is often used for building or road making. It stands hard wear and is not easily weathered after it is in use in a building. There are extensive quarries of this rock near Madras City.

On the West Coast, mica is mined; and bauxite, the chief ore from which aluminium is made is another very useful mineral.

The Cuddapah sandstones are used a great deal for floors and other purposes where a strong flat stone is required. These slabs are particularly useful because they split naturally into flat blocks. This is due to what is known as the jointing of the rock.

Coal. The most important rock which man uses is coal. We have not talked about it yet because it is formed in different way from any of the others. In the past ages forests grew near to the sea shore. When the land began to sink under the sea, the trees were killed and fell to the ground. They were covered by the sea and then by sand brought down by the rivers in the way which we explained at the beginning of the chapter. Later the land was raised out of the sea and the forest grew again. This happened several times. The trees which were buried under the sandstones were changed, by the pressure of the rocks above, into what we now call coal, and to-day we can use the wood which was hidden away under the sea all those years ago. In some countries there is much more than we find in India but we have some in the Deccan, in the valley of the Godavery and more in the Damodar Valley. Look at Fig. 15 and you will find where the more important of our coalfields are situated.

Mineral Oil. In Burma, we find that the vegetable matter of an earlier age has not been converted into solid coal but into liquid oil. This is now conveyed by pipes to Rangoon, from which it is pumped into oil ships, which bring it across the Bay of Bengal to us and take it to other parts of the world as well.

SUGGESTIONS FOR PRACTICAL WORK

1. Get as many specimens of different kinds of rocks as possible and label them with the name and place where they were found.
2. Visit a quarry and try to find out to how many different uses the rock is put.

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CHAPTER V

CLIMATE OF INDIA AND PAKISTAN.

I. TEMPERATURE

LOOK at the map of India and find a line of Latitude called the Tropic of Cancer. It passes across the Indo-Gangetic Plain just north of Calcutta and south of Karachi and it shows the most northerly places which ever have the sun vertically overhead at mid-day. Every place south of this line has the sun shining vertically on it on two days in the year.

The Altitude of the Sun. The easiest way to find out how high the sun is at mid-day is to watch the shadow of a long pole. Go out into your compound and find a pole of some kind, the longer the better. A badminton post does very well. Mark its shadow at, say, 9 o'clock. Go again at 11 o'clock and mark the position then. You will see that the length of the shadow has shortened considerably. If you could watch it for the next hour or so you might be able to find the exact moment when it was shortest. What would this moment be? Look back at chapter one and you will see that this is the moment that we call local noon.

Generally it is not convenient to sit and watch the shadow for such a long time, so the simplest thing to do is to use your pole as the centre of a circle. With a stick and a piece of string draw a circle round it with the length of the 11 o'clock shadow as the radius. Then go into school and get on with your lessons. About ten minutes to one go into the compound again and look at your shadow. Where will it be? Watch it now until the end of it falls on your circle, then mark the point. It will be as far on one side of the noon position, as the line you made at 11 o'clock was on the other side. Therefore if you divide the distance between the ends of the two shadows exactly in half and draw a line from this mid-point to the foot of the pole you will have the position of the noon shadow. What is this line? (See Fig. 16.)

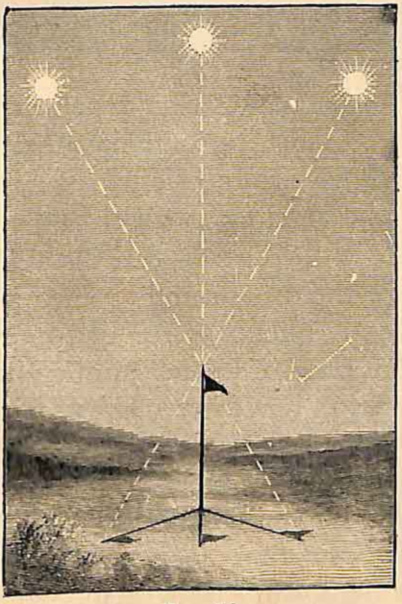

FIG. 16

For the next few days go out about noon and mark the length of the shadow on your line. You will find that if you go the same day in each week there is a distinct difference in the length. It may be getting shorter, which means that the sun is getting higher in the sky each day or it may be getting longer which means that the sun is lower in the sky each day. It depends on the time of year.

The Apparent Movement of the Sun. Look back to page 8 and find out between what months the sun is in the zenith at noon in our part of the world and then ask your teacher to help you find out, from Whitaker's Almanack, when it is overhead at your own school, if this is anywhere south of Calcutta. If you live north of the Tropic of Cancer you will never find the sun exactly overhead but it will be highest in the sky on June 21st. It is not easy to find this out exactly by experiment, because the shadow is so short for some days before and after this date that you cannot tell for certain which day there was no shadow at all. You will probably find that one of the dates when the sun is in the zenith comes in the school holidays, so you will only be able to experiment on the other one. If you are an observant person, you will notice that when the shadow begins to lengthen again it comes on the opposite side of the pole from that on which it was when it was getting shorter. You will have noticed too that the sun comes in different windows of your school. We say that for the summer months the sun is in the north. The further south your school is, the longer will be the time when this is true. We must now try to find an explanation of these facts and then see what effects they have on our climate.

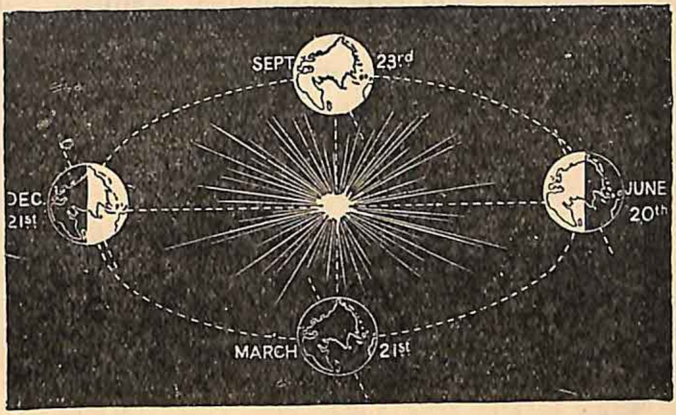

FIG. 17

Look at Fig. 17. You will see that all the year the earth's axis is pointing in the same direction, but that is not at right angles to the line joining the centre of the earth and the centre of the sun. At one time the North Pole is turned towards the sun. We call this summer in the Northern Hemisphere. At the opposite time of the year the South Pole is turned towards the sun. We call that summer in the Southern Hemisphere and winter north of the Equator. Mid-way between these two positions we call the Equinoxes. The summer solstice is June 20th, the winter solstice is December 21st and the Equinoxes are March 21st and September 23rd.

An Experiment to Illustrate the Apparent Movement of the Sun. The easiest way to understand what happens is to darken your room and light a lamp in the middle of the room. Then take a globe and put it in Position A. You will be able to find a point which is directly opposite the light. Now rotate the globe. This spot of bright light will appear to move round the globe and if you put your pencil on it you can see that it traces out a line, the Tropic of Capricorn, the line which shows all the places which have the sun overhead at mid-day once a year South of the Equator. Fig. 19 may make this clearer to you.

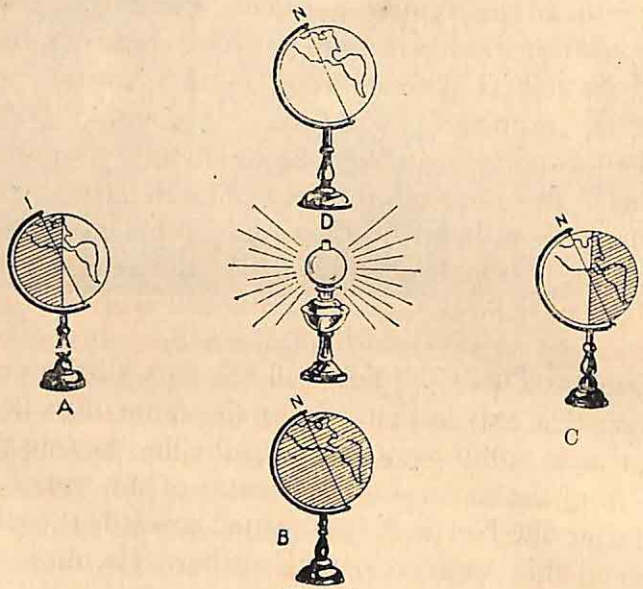

Fig. 18

Now put your globe in Position C and do the same thing. You can now trace out the Tropic of

Cancer. What is this line? Put your globe in Position B and D and you will find that the spot of bright light exactly opposite the lamp will be traced round the Equator if you rotate the globe. Position A shows the relation between the earth and the sun at the Winter Solstice. Position C shows the relation between them at the Summer Solstice and B and D their relation at the Autumn and Spring Equinoxes.

Peninsular India lies between the Tropic of Cancer and the Equator. On March 21st, the sun is in the zenith at the Equator. What do we call this date? On June 20th it is in the zenith at the Tropic of Cancer. At some date between the two it must be in the zenith at your school, if you live anywhere between Jubbulpore and Cape Comorin. That is the first day that you found no shadow from your pole. On September 23rd it is at the zenith at the Equator so at some date between June 20th and March 21st it must be again in the zenith at your school. This is the second date on which you found no shadow at your pole. Between these two dates it appeared to rise in the east and pass through the north at mid-day to set in the west at night. All the rest of the year it passes through the south at mid-day. This is the cause of the change of direction of your noon-day shadow.

The Seasons. When the sun is in the zenith its rays are coming more directly than at any other time of the year. They have more power to heat the earth on which they fall than at any other time. We should therefore expect that between the two dates, when the sun is overhead at mid-day at our school, would be the hottest time of the year. In a general way this is true. We call it the summer season when the sun is more nearly vertical than at any other time and in the Northern Hemisphere Mid-Summer Day is June 20th.

When the sun is shining at the lowest angle it has the least power to heat the earth on which it falls and we call this the winter season. In India and Pakistan these names are not often used because the sun is never very far from the vertical so there is not a great difference between the temperature of the two seasons, but outside the Tropic the difference may be very great. It is still true however, even for these countries, that the coldest time of year is when the sun is least vertical, that is when it is at the zenith at the Tropic of Capricorn. When is this?

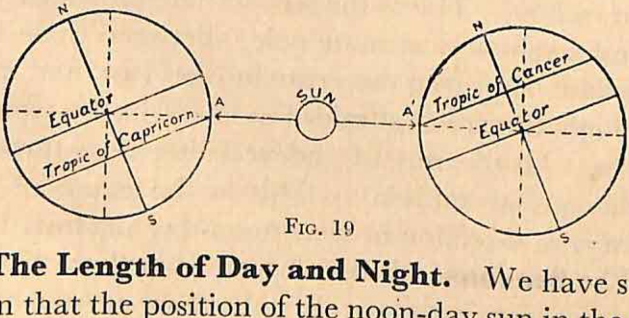

FIG. 19

The Length of Day and Night. We have seen then that the position of the noon-day sun in the sky causes the difference between the summer and winter. It has another effect, this time on the length of the day. Look at the diagram in Fig. 20, then try to make one for yourself. With centre O and radius two inches draw a circle. Through O draw A B and C D at right angles to each other. Then make the angle C O N 23½° and draw N S. Through O again draw E F at right angle to N S. E F now represents the Equator and NS the axis of the earth through the Poles. Shade in with pencil the half of the circle CNAED and you have that portion of the earth which is in darkness every twenty-four hours. You can draw a sun opposite B. Then

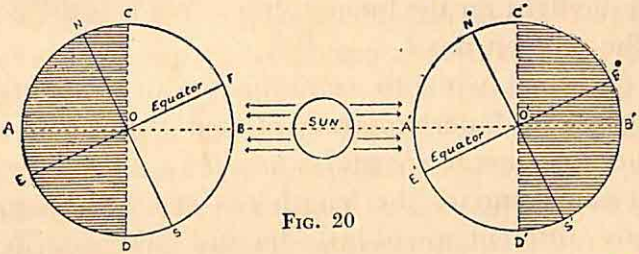

FIG. 20

A B represents the line between the centre of the earth and the centre of the sun.

Now imagine that you live at the point F. What is its latitude? As the earth turns round once in the twenty-four hour how long is F in the daylight and how long in the dark? What time of year is the earth in this relation to the sun? Look back to Fig. 17 if you have forgotten. Now pretend that you are standing at the point F. What time of year is this? How long is F in the daylight and how long in the dark? From this you can see that a place on the Equator both in summer and winter has exactly twelve hours daylight and twelve hours of darkness.

Now take your own diagram and make angle H O F equal to the latitude of your school. Then draw G H parallel to E F. If H represents your school how long is it in the daylight and how long in the dark on Mid-summer's Day? In this diagram H represents Madras and you can see that on the longest day in the year it has 13 hours of daylight and then if you look at H, you will see that on the shortest day it has just as long a night as it had daylight on the longest day. What is the date of the shortest day?

It is worth while to experiment with this kind of diagram and perhaps one of you could make a figure for some towns and others for another so that you can compare the length of daylight at a good many different towns in India and Pakistan. You will then discover that the further away from the Equator you go the greater the difference between day and night. Calcutta has longer summer days and shorter winter ones than Madras and Peshawar has longer summer days still. If you go outside these countries the difference is even more marked. Let one pupil draw a diagram for Latitude 66½°, the Arctic Circle, and see what happens there. What happens to the day and night at the Poles?

We have now found out two things about the seasons. In the summer the sun is higher in the sky than at any other time of the year, therefore the amount of heat which it gives to the earth is greatest then. We should therefore expect that as the number of hours which it shines is greater than at any other time, so again the amount of heat it is able to give is greatest then. We should therefore expect that the months of May to August, when the sun is always in the zenith somewhere in Peninsular India, would be the hottest months of the year and that of these months, June would be the hottest of all since the days are longest then. What date is the longest day?

On the whole these statements are true but there are some other things which have to be considered. These tend to modify the effect of the sun's positions on the temperature of the air at any place. The best way to understand this is to look at some actual temperature charts and to try to explain the results which you see there. We cannot do a great many in this book but if you work through a few typical ones given here you will find it quite easy to explain any others which you may meet.

Temperature Charts. We will begin with two towns in South India. Look at the diagram and then make one for yourself from the figures given at the end of the chapter. The neatest kind of graph is made if you use two small squares for each month and mark your temperature on the middle line of each. The figures given are the average temperatures for the months taken over a great number of years. If you keep a record of your own school temperatures, you may find that they differ greatly in any one year. We cannot talk about the climate of a place unless we have the results of many years' records and can generalise about them.

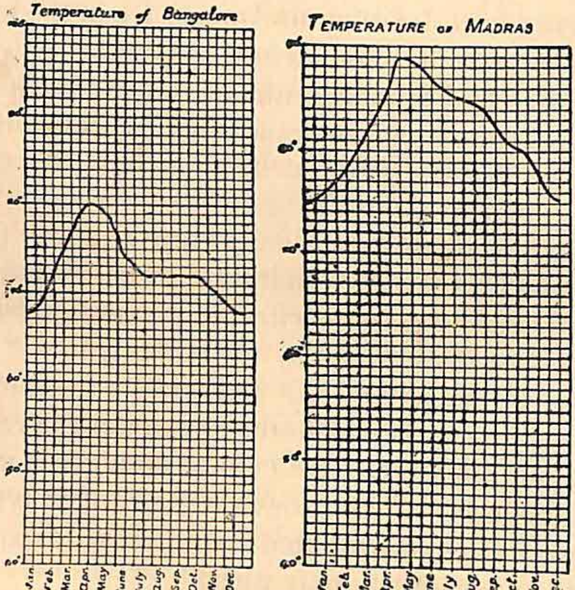

FIG. 21. Temperature Charts

Now see how many things you can say about the temperature of Madras from the graph. First it is clear that the temperature is never very low. What is the lowest? In which month is it found? Can you explain this? The latitude of Madras is only 13° N therefore the sun is in the zenith twice in the year; in May and August. The altitude of the sun is high for at least six months of the year, a month before it reaches the zenith and a month after it passes again. The lowest temperature comes when the sun's altitude is lowest or a little after. When is this?

The temperature is never very high either. This takes more explanation and we will talk about that when we have another town with which to compare it. The highest temperature comes in May, which is what we should expect, for the sun is in the zenith then and the days are getting long as well. Why is the temperature not equally high in August when the sun is again vertical at mid-day? We will answer these questions whenwe get some more figures with which to compare those of Madras.

Now let us draw a diagram for the temperature of Bangalore. The latitude is almost the same but there are two differences in the situation. Madras is at sea-level and at the sea coast. Do these two factors make any difference in the temperature of the two towns? Look and see. The lowest temperature of Bangalore is lower than that of Madras: is it not? Can you explain this? You know that some people go to the Hills for the Hot Weather. Why is this? Because it is always cooler there. If you go up a mountain side you find that on an average the temperature drops 1° for every 300 ft. As Bangalore is 3,000 ft. higher than Madras you would expect its lowest temperature to be about 10° lower than that of Madras would you not? Now look and see if it is so.

Madras is by the sea. If you put your hand into a bowl of water at mid-day and then put the other hand on to a stone, which has been beside the water in the sun all the morning, what do you find? The water feels quite cool but the stone is very hot. Now try the same experiment in the early morning after the stone and the water have been out of doors all night. Exactly the opposite is the case. The water feels warm while the stone feels cold. This is one of the most important things to remember if you want to explain the climate of any place. If it is near the sea it will have a comparatively warm winter but also a cool summer. Madras is distinctly warmer than Bangalore in December and January.

We see then that places in South India have comparatively high temperatures all the year and that their highest temperature comes in May. The range of temperature, the difference between the highest and lowest, is not great anywhere in the South.

The Temperature of North India. Now let us turn to North India and make a graph for Lahore. Here we find several differences immediately. First of all the time of the highest temperature is no longer May but June. Can you explain this? Find the latitude of Lahore. Is the sun ever in the zenith there? If not when is it highest in the sky? June 20th, is it not?

The lowest temperature is much lower even than that of Bangalore. How high above sea-level is Lahore? Has height anything to do with this lower temperature? No, for it is considerably nearer to sea-level than Bangalore but it is much further from the sea, so that is one reason for its lower temperature but is it the only one? Look at its latitude again. What will be the altitude of the sun at mid-day in December? Much lower than at Madras or Bangalore will it not? How long will its nights be in December? A good deal longer than the days, so that every night the earth loses a little more heat than it receives during the day. The winter days get shorter and colder, as the weeks go on, until the shortest day is reached. When is this? Look carefully once more and see which months had the lowest temperature of all. Is it December? No. You would expect the shortest day and the lowest altitude of the sun to make the lowest temperature come in December would you not? Why then does it come a month later?

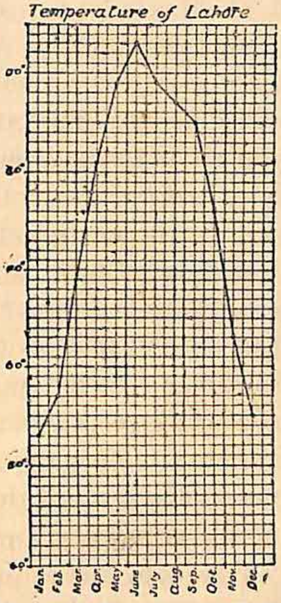

FIG. 21-A. Temperature Chart

The sun heats the earth but the temperature which we take is that of the air above the earth. The sun's rays pass through the air scarcely heating it at all. You can easily discover this for yourself if you ever get an opportunity to go to the Hills. The air is quite cool but if you sit in the sun you will get very hot yourself and the ground on which you sit may be almost too hot to touch. The air is heated by conduction from the earth. The layer nearest the earth gets hot first, than the one above it and so on. This is one reason why by the time you get to the top of a mountain the air is so much colder than it is on the plain below. It takes time for the air to get warmed by the earth. At the other end of the year the same thing happens and it takes time for the air to cool even after the earth has cooled down below it. This is why the coldest month is usually some time after the shortest day.

You may be asking why the hottest month is not sometime after the longest day. It is, in places outside India but there is a special reason why this is not so here which we shall discover in the next chapter.

Now let us look at the temperature maps for India. We generally use what we call *isotherm* maps in which the temperatures have been shown as if all the places were at sea-level. How would you find the " sea-level " temperature of a place if you were given its " actual temperature "? An isotherm is a line drawn through all the places

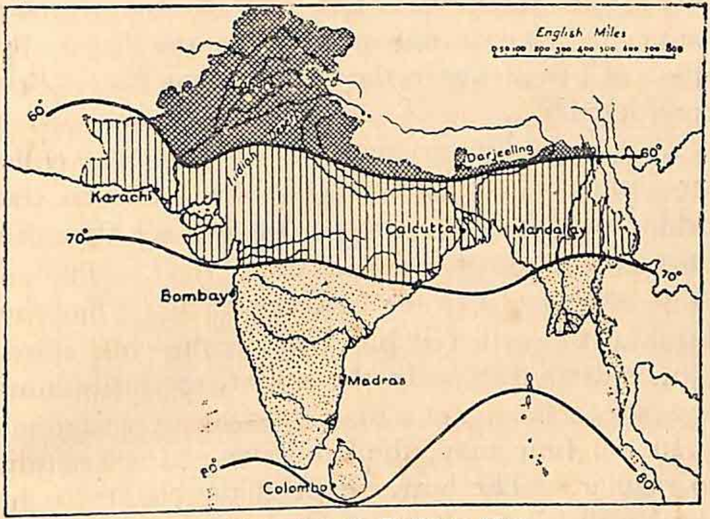

FIG. 21-B. January Isotherm Map

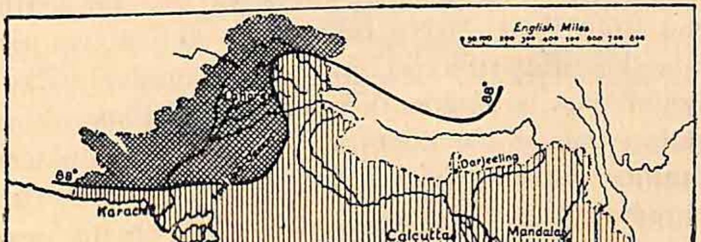

FIG. 21-C. June Isotherm Map

which have the same temperature, and it is much easier to compare one place with another if the effect of height above the sea does not have to be considered.

Look at the January map. Why do we draw one for January? It shows us the conditions in the coldest month of the year. You will see that the lines run more or less East and West across the map, showing that the further you get from the Equator the colder it is. What is the chief thing that matters then? In the winter, the latitude of the place.

In the June map, the isotherms are not nearly so regular. The hottest part of the country is in the North-West. It is a long way from the sea, it is surrounded by mountains which reflect back the heat from their barren rocky sides and above all it is the driest part of the whole country. The coolest part is on the West Coast and that is the wettest part of the country. You see that in the summer, latitude has very little to do with the temperature of our country, distance from the sea and the amount of the rainfall having much greater influence on it. We shall talk about the rain in the next chapter.

SUGGESTIONS FOR PRACTICAL WORK

1. Make the Length of Daylight diagrams as suggested in the text.
2. Draw temperature graphs for the following towns from the figures given below:—

   A—Madras. B—Bombay. C—Calcutta. D—Banaras.

E—Lahore. F—Peshawar. G—Poona. H—Bangalore. J—Jacobabad. K—Kozhikode.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
A.	75	77	80	84	89	88	86	85	84	81	78	76 °F
B.	74	75	78	82	85	82	80	80	80	81	80	76 °F
C.	65	70	80	85	86	85	83	82	83	80	72	65 °F
D.	60	65	77	87	91	90	84	83	83	80	68	60 °F
E.	53	57	69	81	89	93	89	87	85	76	63	55 °F
F.	50	53	63	74	84	91	90	88	82	71	59	51 °F
G.	53	55	62	68	72	74	72	71	69	66	59	53 °F
H.	68	72	77	80	79	74	72	72	72	72	70	68 °F
J.	58	64	75	85	95	99	96	93	90	82	70	61 °F
K.	78	80	82	84	83	79	77	77	78	79	80	78 °F

3. Looking at the graphs which you have drawn and answer the following questions:—

   What are the chief differences to be noticed in the temperatures of the West Coast-Calicut and Bombay, and those of the East Coast-Madras?

   What changes in the temperature do you find as you go up the Ganges Valley towards the Punjab? Use the graphs for Calcutta, Banaras, Lahore and Peshawar to answer this question.

   Which of these towns has the highest summer temperature? The lowest winter temperature? The greatest range of temperature?

   Which has the least range of temperature? Can you explain this?

4. Keep a temperature chart for a month for your own school using a maximum and minimum thermometer if you can get one. Take the average of the two readings for each day and plot the result on a graph.

5. Get the figures for your own town if you can and plot them on a graph. Describe the temperature of your town in the same way in which that of Madras is described in the text.

CHAPTER VI

CLIMATE OF INDIA AND PAKISTAN.

II. RAINFALL

Rainfall of the West Coast. We have seen that the temperature of some places is dependent on the amount of rain which they receive. Let us look at the rainfall charts of several towns in India and Pakistan and see what they tell us. Then we will try to find the reason for the things which we discover. Look first at the chart for Kozhikode as shown in Fig. 22. You will see at once that the total amount of rain is very high and that almost the whole of it comes in the months of June, July and August. The rain begins very suddenly and finishes almost as suddenly. If you now put the temperature and rainfall graphs together on the same diagram you will notice that the temperature drops suddenly just as the rainfall rises.

The rainfall in Bombay (see table on p. 91) is nearly the same as in Kozhikode but the total amount is not so much and especially there is less in October and November. If you now put the temperature and rainfall figures together you will see that in Bombay the temperature rises when the rain ceases, before it drops once more with the close of the year. Why is this not so at Kozhikode?

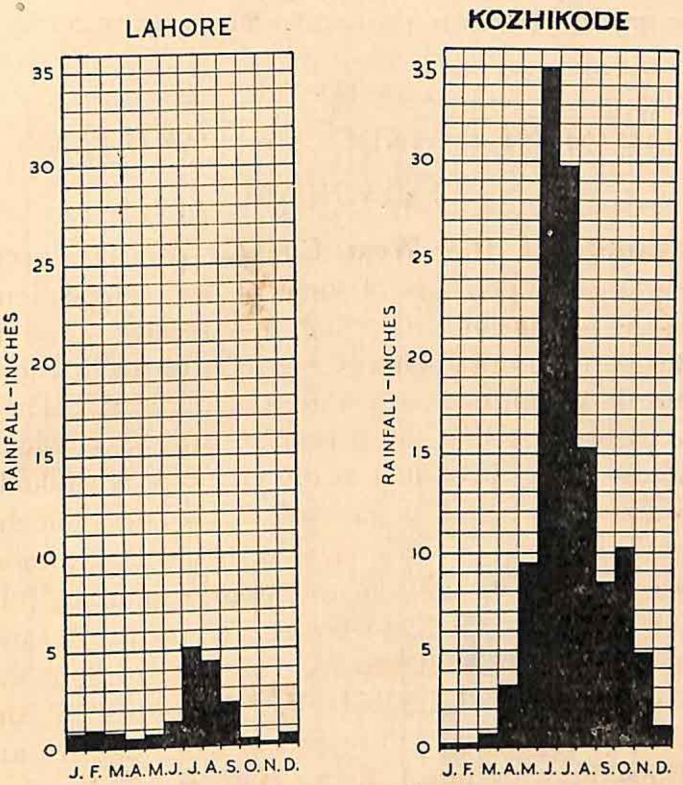

Fig. 22. Rainfall Charts

Rainfall of the Ganges Valley. Now let us look at the rainfall graphs of the Ganges Valley. We will take the same towns which we used for illustrating the temperatures of different parts of the country. The graph for Calcutta is very like that of the West Coast towns. As we go up the valley the amount of rainfall decreases but we still have the sudden rise in June or July. When we get to Peshawar the total amount is much less than in Calcutta and the time of year has changed as well. There are two rainfall seasons, the summer one like all the other places which we have seen and then another in the winter. If we put the temperature and rainfall graphs together we shall see that as the rainfall decreases, the range of temperature increases. This is very easy to understand

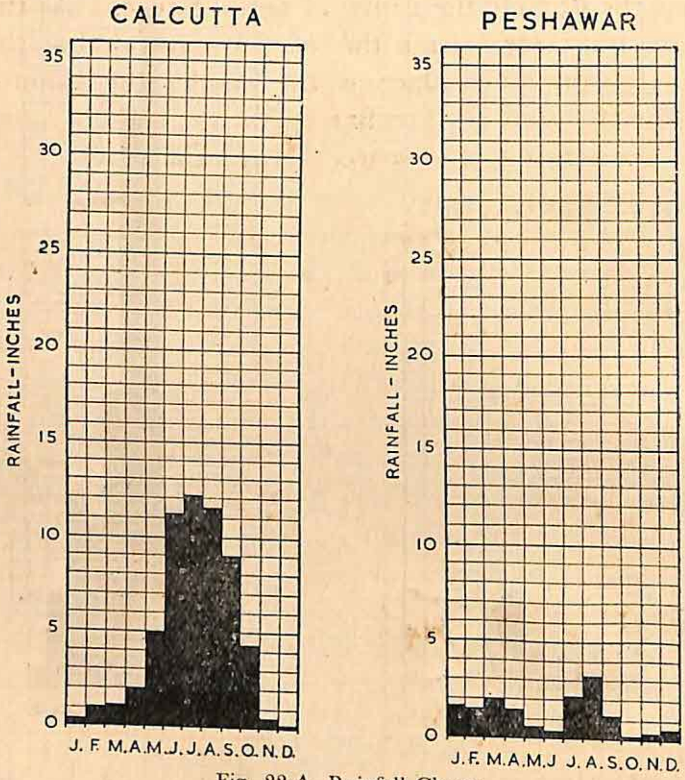

Fig. 22-A. Rainfall Charts

for we said that the further a place was from the sea the greater the range of temperature. As the rain must come from the sea it is natural that the further inland a place is the smaller the amount of rainfall will be. Jacobabad has the highest range of temperature and scarcely any rain at all.

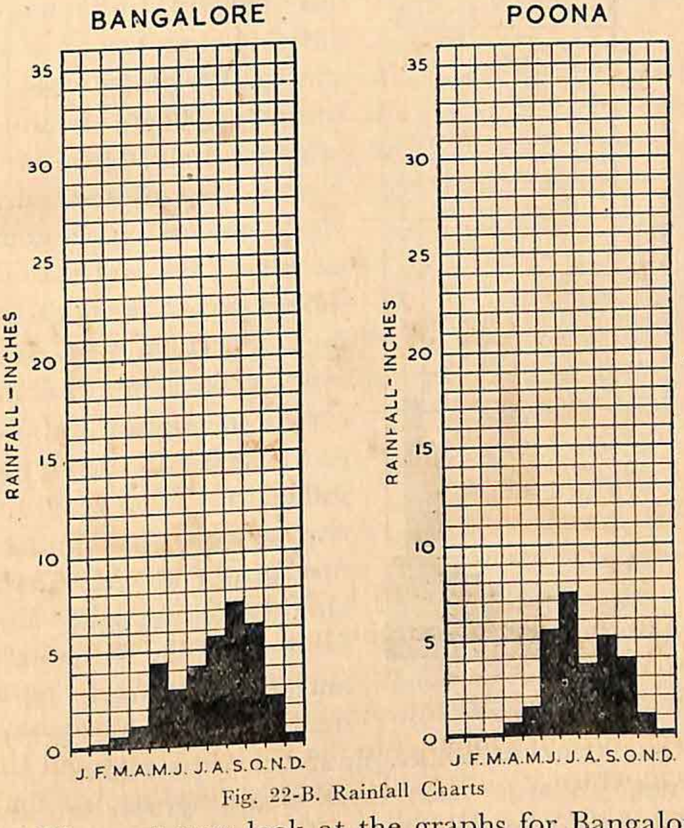

Fig. 22-B. Rainfall Charts

We must now look at the graphs for Bangalore and Poona. You will see that the amount of rain is very much less than the West Coast, but the time at which it falls is the same.

Rainfall of the Madras Coast. If we look now at the chart for Madras we see at once that the rain comes in October, November and December and so this part of India has a different wet season from all the other places we have studied. There is some rain in June, July and August, let us see what effect this has on the temperature. We said that we should expect the hot weather to return when the sun was once more in the zenith in August but the rain which falls then is just sufficient to prevent the rise, so that the temperature graph for Madras is almost a straight line from June to September and then it drops fairly smddenly. Look back at your temperature graph and see that these statement are true; then, on the same graph put the rainfall from the figures shown at the end of this chapter.

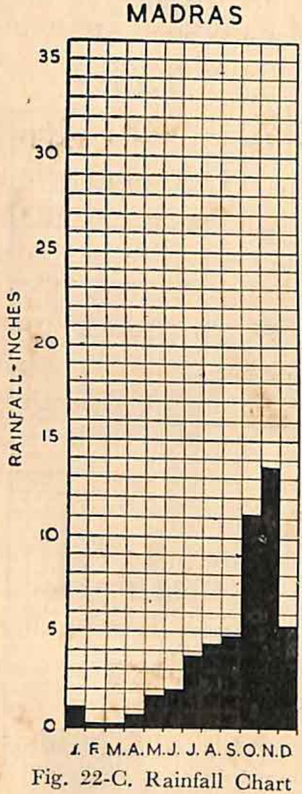

Fig. 22-C. Rainfall Chart

It is much easier to understand the climate of any place if you can see both rainfall and temperature on the same graph so it will be a good thing if you draw graphs for yourselves from the figures you will find at the end of these two chapters and draw them both on the same sheet. You must take care to use the same scale for all your diagrams or you will not be able to compare them properly.

Rainfall Maps. Now let us turn to the rainfall maps of India and Pakistan. The summer one shows that the heaviest rainfall is found on the West Coast and in the Ganges and Brahmaputra deltas. As we come inland from the West Coast the amount drops rapidly so that the greater part of the Deccan plateau has a very small rainfall. The quantity decreases up the Ganges Valley till in Sind there is practically none at all. In Burma, the West Coast has a good rainfall but again inland the amount decreases.

The winter map shows that the greater part of the country has very little rain; but the South-East Coast gets nearly the whole of its rain then. Some also falls in the North-Western corner of the Punjab during these months. The total quantity which falls at this time is much less than in the summer.

Let us now try to understand why we get such variations in the rainfall of our land. You all know that when the air, which contains water vapour, is cooled, the gaseous water changes to liquid form

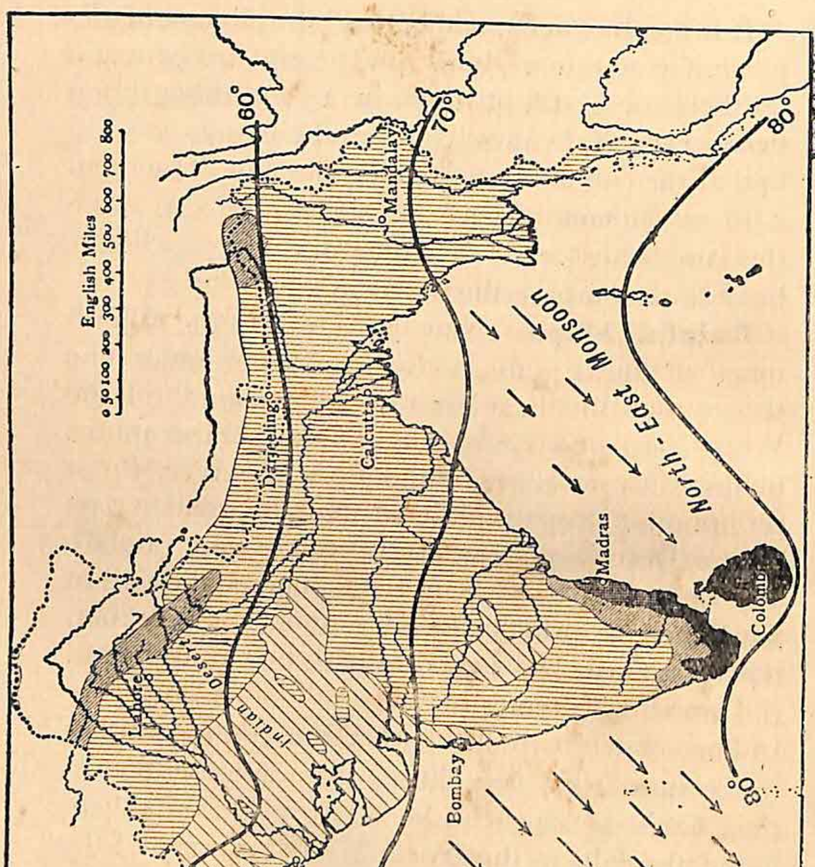

FIG. 23. The Winter Monsoon over India and Pakistan

and drops as rain. The quantity which falls depends on how much water there was in the air at the beginning and how much the temperature has been lowered.

Let us take the South-East Coastal Plain first. The rain falls in the colder months of the year when the North-East wind is blowing. It comes across the Bay of Bengal and on the way it absorbs a considerable amount of water vapour. You will remember that in the last chapter we said that in the winter months the sea was warmer than the land. When the wind reaches the shores of Madras, the temperature falls and some of the water vapour is dropped as rasn. This kind of rain is known as Coastal Rain and it does not usually pass very far inland. As the Bay of Bengal is not very wide the amount of rain which can fall is not very great. This is why the East Coast gets so much less than the West.

The S. W. Monsoon. The rainfall of the rest of India is dependent on the Monsoon winds. In the summer months the sun is in the zenith at the Tropic of Cancer, is it not? The great wind belts

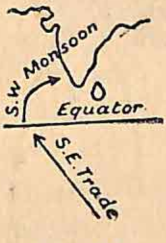

FIG. 24

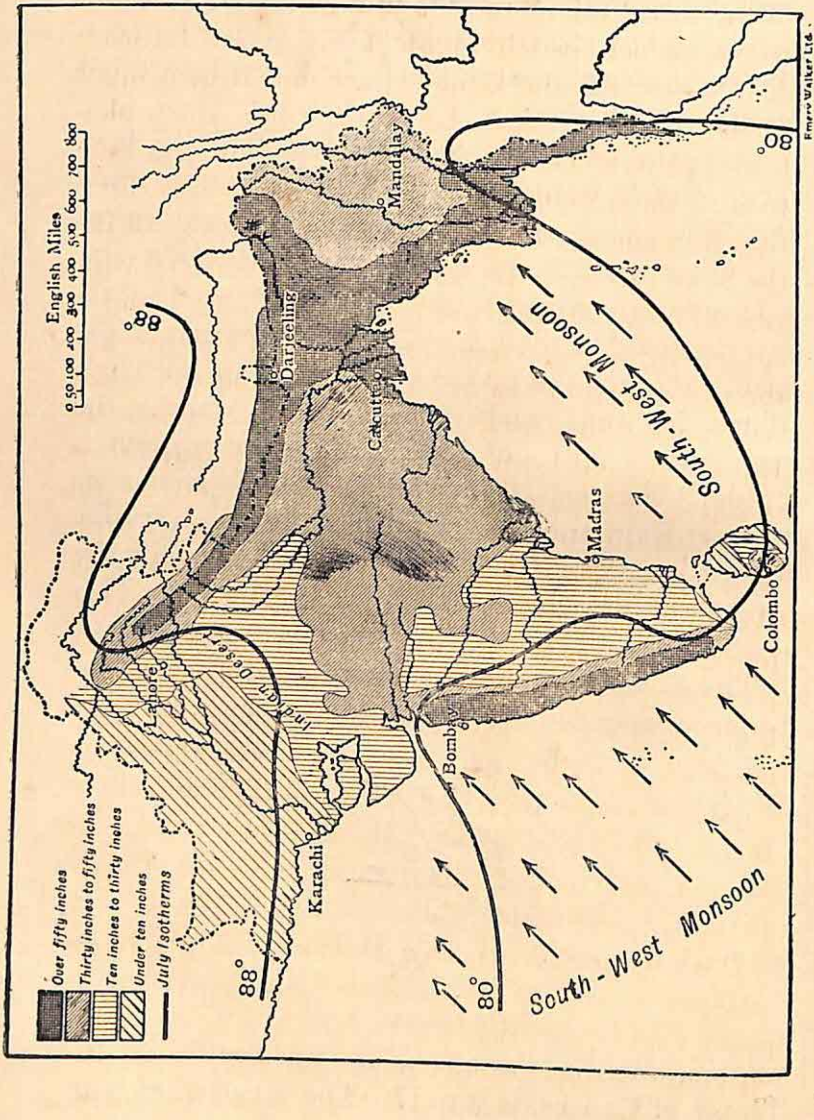

Fig. 25. The S.W. Monsoon

of the world follow the sun and so the N. E. Trade winds, which usually blow from about Latitude 35° N. towards the Equator, are now drawn much further north. The S. E. Trade winds which blow from Latitude 35° S. towards the Equator now have to cross the Equator. When they do this their direction is changed from S. E. to S. W. and we call this the S. W. Monsoon. A monsoon is a seasonal wind which blows in the summer months only and is caused by the apparent movement of the sun and the very unequal heating of the land and sea. You will notice that this wind, if it has crossed the Equator, has blown across very large expanse of ocean. The water is very hot in this part of the world, so that the air has been able to carry a great deal of moisture with it. When it reaches the West Coast of India it can no longer blow at sea-level for it has to cross the Western Ghats. As it rises to cross the hills, which are more than 5,000 ft. high in most of their length, it expands; as it expands it cools, and when it cools the water vapour changes to rain. This rain falls mostly on the seaward side of the hills and that is why the West Coast has so much rain while the Deccan plateau has so little.

The Rainfall of the Deccan. The Deccan plateau is said to be in rain-shadow. When the wind has crossed the hills it descends again. As it descends it gets compressed, as it gets compressed it gets warmer and instead of losing its moisture it takes up more. Close to the Western Ghats, the compression is greatest and therefore this is the driest part of the plateau. By the time it reaches Madras it often loses a certain amount of moisture which accounts for the small summer rain of the East Coast.

The Rainfall of the Indo-Gangetic Valley. The rainfall of the Indo-Gangetic Valley is not quite so simple as that of the West Coast. When the sun is in the zenith at the Tropic of Cancer all the land near the tropic gets very hot. The Thar Desert is especially hot for it is dry and rocky. The air above it gets hotter and hotter as the weeks go by. This hot air rises and a stream of cooler air comes in from all sides to take its place. Because of the shape of the Ganges Valley which is like a funnel with the hot desert at the far end, the largest stream comes up from the South-East. This wind carries with it much moisture from the sea. What causes it to deposit the moisture as rain?

Convection Rain. The whole of India is hot by the end of May and the beginning of June. The air which is now moving up the Indo-Gangetic Valley, as it passes inland gets heated too. It then rises and is cooled by expansion, and the moisture which it carries is turned to rain which falls on the spot over which the air has risen. You will see that this is not quite the same kind of rain as that found on the West Coast. As it is due to an overturning of the air current it is known as *convection* rain. You must find out about convection currents in your Elementary Science classes. The air nearest to the sea contains more moisture than that further inland and so we get the heavy rainfall of the delta lands. By the time that the current reaches the Thar Desert it contains practically no moisture at all and although the convectional overturning takes place there, no rain can fall. There are other air currents coming into the centre at the North-Western end of the Indo-Gangetic Plain but as you will see from the map (Fig. 26), they are all land winds except the one coming up the Ganges Valley. They can therefore give no rain, so this is one of

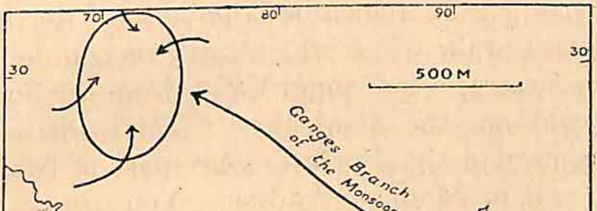

FIG. 26

the driest places in the world and also one of the hottest.

The South-East wind is called a monsoon too since it is a wind which blows only in the summer season and is caused by the movements of the sun. The season is usually not called summer, but the season of the S. W. Monsoon, in India. If you use this term, please remember that one of the most important of the winds which bring the rain of this season flows up the Ganges Valley from the South-East and not the South-West. This same wind brings rain to the North-Eastern part of Madras State and to Madhya Pradesh. You can see this quite clearly in the map, Fig. 25.

The Retreating Monsoon. After the month of August when the sun is no longer in the zenith anywhere in India, the land begins to cool down, the sea becomes hotter than the land and the currents of air, which during the hot weather were all drawn towards the land, turn round and move in the opposite direction. The S. W. wind becomes a North-East one and the South-East wind a North-West one flowing down the valley instead of up it. These are both dry winds since, except in the case of the Madras Coast, they flow over the land and so the rain ceases as suddenly as it began.

Cyclones. We have said nothing about pressure, in our description of the wind systems of India, because it would take more time than you have to spend to explain fully. You probably know that in October when the winds are changing from the South-West to the North-East, and sometimes in April and May when they are changing in the opposite direction, we get very destructive storms

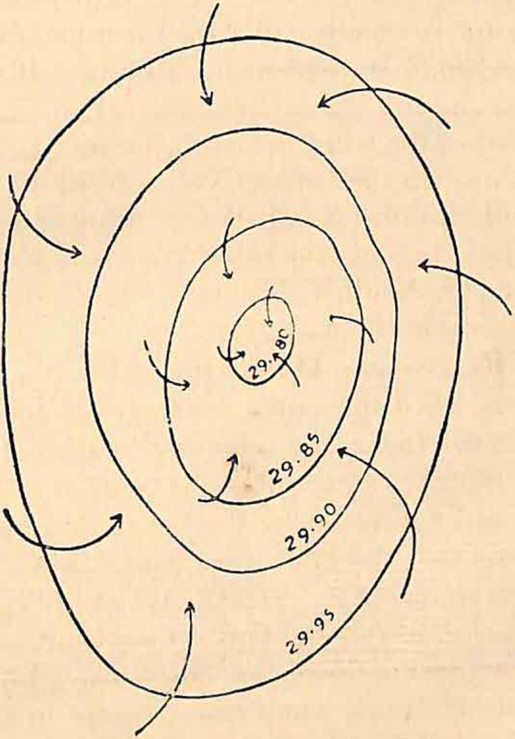

Fig. 27. The direction of wind in a Cyclone.

which are called *cyclones*. They come across the Bay of Bengal usually and sometimes do a great deal of damage. In a cyclone, the lowest pressure is in the centre and all the winds blow towards it in an anti-clockwise direction. Look at Fig. 27.

The whole low-pressure system moves in the direction of the prevailing wind and so the cyclone moves from one place to another and ships can be warned of its approach. We cannot say for certain when or where it will come; but usually it is possible to say when it is likely to strike any given place and the path which it is likely to follow. In this way people can be warned in time and are able to take precautions. In the centre of the cyclone, where the pressure is lowest the winds are most strong and it is the places which lie in the path of this centre which suffer most. You must find out more about pressure in your Elementary Science

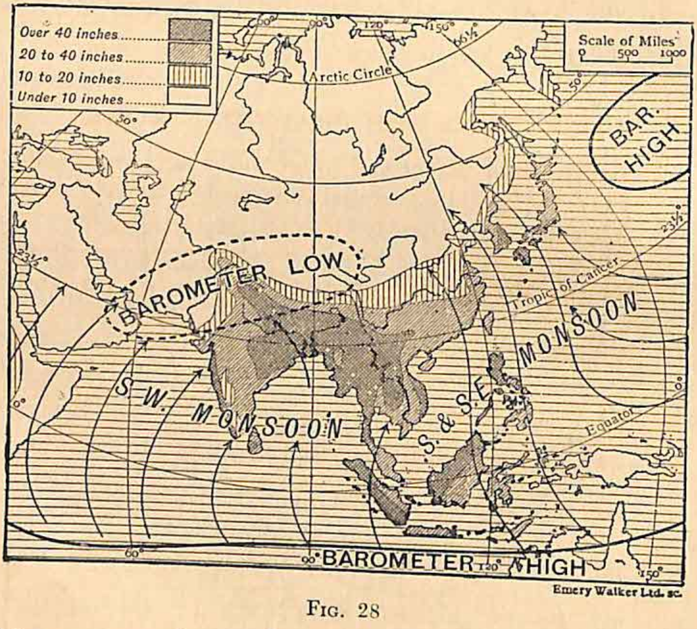

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Fig. 28

lessons and if it is at all possible you should keep a record of the pressure at your school by reading the barometer several times a day and recording your readings on a chart. It is best to do this during October and April when the changes are likely to be most striking. Notice the direction of the wind at the time that you read the height of the barometer and try to see if you can discover anything about the connection between the two.

SUGGESTIONS FOR PRACTICAL WORK

1. Keep a rain gauge and enter the results on a chart. Find the weekly average and make a weekly chart. Then make a monthly chart in the same way.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
A.	1·1	0·3	0·3	0·6	1·8	2·0	3·8	4·5	4·9	11·2	13·6	5·4
B.	0·1	0	0·1	0	0·7	20·6	27·3	16·0	11·8	2·4	0·1	0
C.	0·4	1·1	1·4	2·0	5·0	11·2	12·1	11·5	9·0	4·3	0·5	0·2
D.	0·7	0·6	0·4	0·2	0·6	4·8	12·1	11·6	7·1	2·1	0·2	0·2
E.	0·9	1·0	0·8	0·5	0·7	1·4	5·1	4·7	2·3	0·3	0·1	0·4
F.	1·7	1·5	2·0	1·5	0·7	0·5	2·2	3·3	1·2	0·3	0·4	0·6
G.	0·1	0·1	0·1	0·6	1·4	5·4	7·2	3·7	5·1	4·0	1·1	0·2
H.	0·2	0·3	0·6	1·2	4·5	3·0	4·1	5·8	7·4	6·2	2·4	0·4
J.	0·3	0·3	0·3	0·2	0·1	0·2	1 0	1·1	0·3	0	0·1	0·1
K.	0·4	0·2	0·7	3·6	9·2	33·1	32·5	17·2	7·9	10·3	5·5	1·1

2. Draw the graphs for the rainfall of each of the following towns and if the temperature graph is already drawn enter the rainfall on the same diagram.
A—Madras. B—Bombay. C—Calcutta. D—Banaras. E—Lahore. F—Peshawar. G—Poona. H—Bangalore. J—Jacobabad. K—Kozhikode.
3. Describe the climate of each of the towns for which graphs have been drawn.
4. Write a short description of the climate of India and Pakistan as far as temperature and rainfall are concerned, using all the facts available from graphs and maps.

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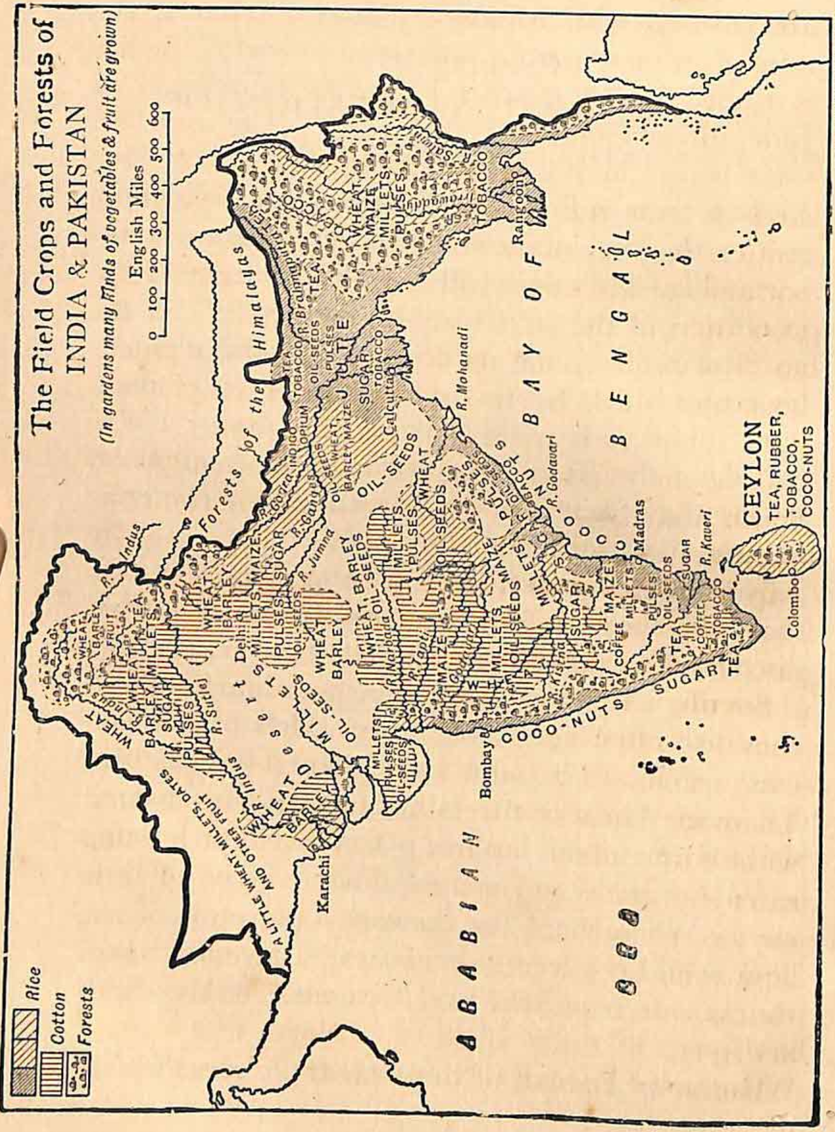
CHAPTER VII

THE NATURAL VEGETATION OF INDIA AND PAKISTAN

WE pass on now from the climate of the two countries to the vegetation which covers them. Look first at Fig. 29. You will see that quite a large proportion of the land is under cultivation. Man has cleared away the natural growth and planted the crops which he needs for food or other purposes. This is true throughout the Ganges Plain and along the East coastal plain. Large areas in the Bombay State and in North-Western Hyderabad are under cultivation too.

Evergreen Forest. The Western slopes of the Ghats are covered with evergreen forest. Look at the rainfall map and notice that these trees grow where there are more than 80 inches of rain a year. They are often very large trees which have hard wood trunks. The same kind of forest is found on the lower slopes of the Himalayas and in Assam. What is the rainfall in these places? Not much use is made of the wood in these forests. Can you see why? Where would be the easiest place to cut it? How would the logs be sent to the sawmill? For what purpose could the wood be used? Who would buy it?

Monsoon Forest. Now look at the areas which



Emery Walker Ltd. sc.

Fig. 29

are covered with Monsoon Forest. What is the rainfall in these parts? Between 40 and 80 inches is it not? In these areas, before the rains break in June, the temperature is very high. The trees lose their leaves in this hot weather and so they are *deciduous* and not *evergreen* trees. You will know quite a number of them I expect. The most important are the *teak* which we find in parts of the Deccan, and the *sal* which is found chiefly in the north of India, along the lower slopes of the Himalayas and in the North-Eastern part of the plateau. Both these trees are much used for timber. The teak of the Western Ghats is used for building in South India but it is not easy to get it from the forest so that teak from Burma is brought over by ship from Rangoon and may be sold for less than that which comes from Western India. Can you discover the reason for this?

Scrub. The next type of vegetation for us to consider is that known as scrub. Most of you who live in Peninsular India know what this looks like. There may be a few trees but they will be covered with thorny spikes. Why? To prevent their being eaten by cattle and goats. They will be of little use except perhaps for firewood, and most of the land will be covered by coarse grass and small shrubs. It is on this land that most of the sheep and goats of India are kept. Where is it found? What is the rainfall of these areas? Less than 40 inches.

Desert. We are gradually passing from the wetter lands to the drier, you see, and when we reach the really dry lands of the North-West we come to semi-desert and finally to desert itself. Here only plants with thick long roots or fleshy leaves will grow and man cannot make a home of any kind there. In some parts, however, where water from the river can irrigate the land it becomes quite fertile and good crops can be grown. We shall see in the next chapter how man has overcome his natural difficulties, but here we are only talking of Natural Vegetation.

Mountain Vegetation. On the slopes of the Himalayas above 5000 ft. and on the Nilgiris and Palnis of South India quite a different kind of forest growth is found. Here the trees are more like those of temperate countries. Firs and pines and other coniferous trees are most important in North India while in the Southern Hills blue gums and wattles from Australia have been planted. They can scarcely be called " Natural Vegetation " since they were planted in the first place by man but they have now spread so rapidly and over such large stretches of country that they may be said to be semi-indigenous.

Above the pine forests the mountains are covered with small bushes and grass until it is too cold for any plants to grow at all. On the highest parts of the Himalayas there is snow all the year round.

Swamp Forest. In Bengal at the mouths of the

Ganges and Brahmaputra we find a special kind of forest, known as the *Sunderbands*. The trees, usually mangroves, in these forests have their roots covered by salt water at each high tide. They grow only in the muddy deltas of the rivers and help to bind the soft silt together and so form new land.

The forest products of India are not very important since they are so difficult to remove. Why is this? Think of the position of the great forests on the hill slopes and the lack of rivers to float the good timber down to the plains. Think why the Himalayan rivers cannot be used to any extent for this purpose and then compare with the conditions in Burma. The teak is the most important timber tree used in India and Pakistan, and the rest of the forest land, chiefly the scrub forest is used for pasture for sheep, cattle and goats. Large areas are reserved by the Government and improvements made by planting new trees and protecting those which will yield timber.

SUGGESTIONS FOR PRACTICAL WORK

1. Visit any uncultivated land near your school and make a list of the plants which you find there, saying to which class—trees, shurbs or herbs, each belongs. Try to find out if the land is used for grazing or if the trees are cut for firewood. If it is a reserved forest try to find what is being done by the Forest Department.
2. Collect pictures of the different types of vegetation found in our country and paste them in a book.

CHAPTER VIII

IRRIGATION IN INDIA AND PAKISTAN

WE have seen how much the natural vegetation is dependent on the rainfall. In this chapter we are to see how man has tried to overcome the difficulty of insufficient water supply where he desires to grow crops, by different methods of irrigation.

Irrigation in the Punjab. Where is the driest part of our land? In the North-West. Here there is much flat land and good soil which will yield good crops of grain if only the water can be provided, so it is here that we find the largest irrigation works. The Indus and the upper part of the Ganges and their tributaries, fed by the snows of the Himalayas, have water in their beds all the year round. A great wall or dam is built across the river at some convenient point. Behind this the water of the river collects in a great lake or reservoir. In the wet summer months there will be more water than is needed to fill the lake and it is allowed to escape through gates in the dam. In the dry season, when the water is most needed in the fields, the water stored in the reservoir is allowed to pass out into canals which have been cut across country to the places where it is needed. If you can get a map showing some of these canals in the Punjab look to see how they cross the contours. You will find that in most cases they are parallel to them. Why? The water in the channels must flow very slowly or it will be lost and therefore the slope of the channel bed must be very, very gentle indeed. From the large main channel smaller ones branch out on either side and from these, smaller ones still, until the water reaches the fields, often miles away from the reservoir. All this work has cost much money and the channels must be kept in constant repair but the water so stored and distributed has made it possible to grow crops and so feed people on many square miles of land which were barren before.

The Cauvery Irrigation Works. Although the greatest of these irrigation works are in the Punjab and Sind there are some in the Madras State. The Cauvery River is used for this purpose and great dams have been built across it in more places than one. We spoke of the Mettur dam when we were talking about rivers and hydro-electric power. At this place, after the river has left the plateau, a large dam has been built across the bed and the water stored in the rainy season. There are no channels cut from this point but the water is stored till the dry season. Then it is allowed to flow down the river itself till it reaches the delta where there are many channels cut, so that the Tanjore district can be sure of water at all times of the year. The great difference between the Indus works and those on the Cauvery is that these latter are dependent on the rain alone. Which monsoon supplies the Cauvery with water to store?

There are many more smaller works in the State. The Red Hills Lake is fed from several small rivers which have had their courses changed or small dams have been built across their beds. This lake supplies Madras City with water as well as irrigating the fields around its shores.

The Periyar Scheme. There is one specially interesting work in South India. The river Periyar is fed by the rain on the western slopes of the ghats and used to flow down the Western side of the hills to the Arabian Sea. Now a great tunnel has been cut through the hills and the water made to flow through it to the Eastern side of the Ghats so that the land around Mathurai is irrigated with water, which a few years ago was allowed to flow away to the Arabian Sea, doing no good at all.

Tank Irrigation. The type of irrigation which is found most frequently all over the Deccan, however, is that which is supplied by tanks. These are small artificial lakes made by building a bund across a small stream and so collecting the water which flows into it during the rainy season. There are very few of these which contain water for more than a few months and so they are very much less valuable than the works on the great rivers. Nevertheless, by this means, large areas in the Madras State are enabled to grow rice which would otherwise have to grow dry-crops only; and so they

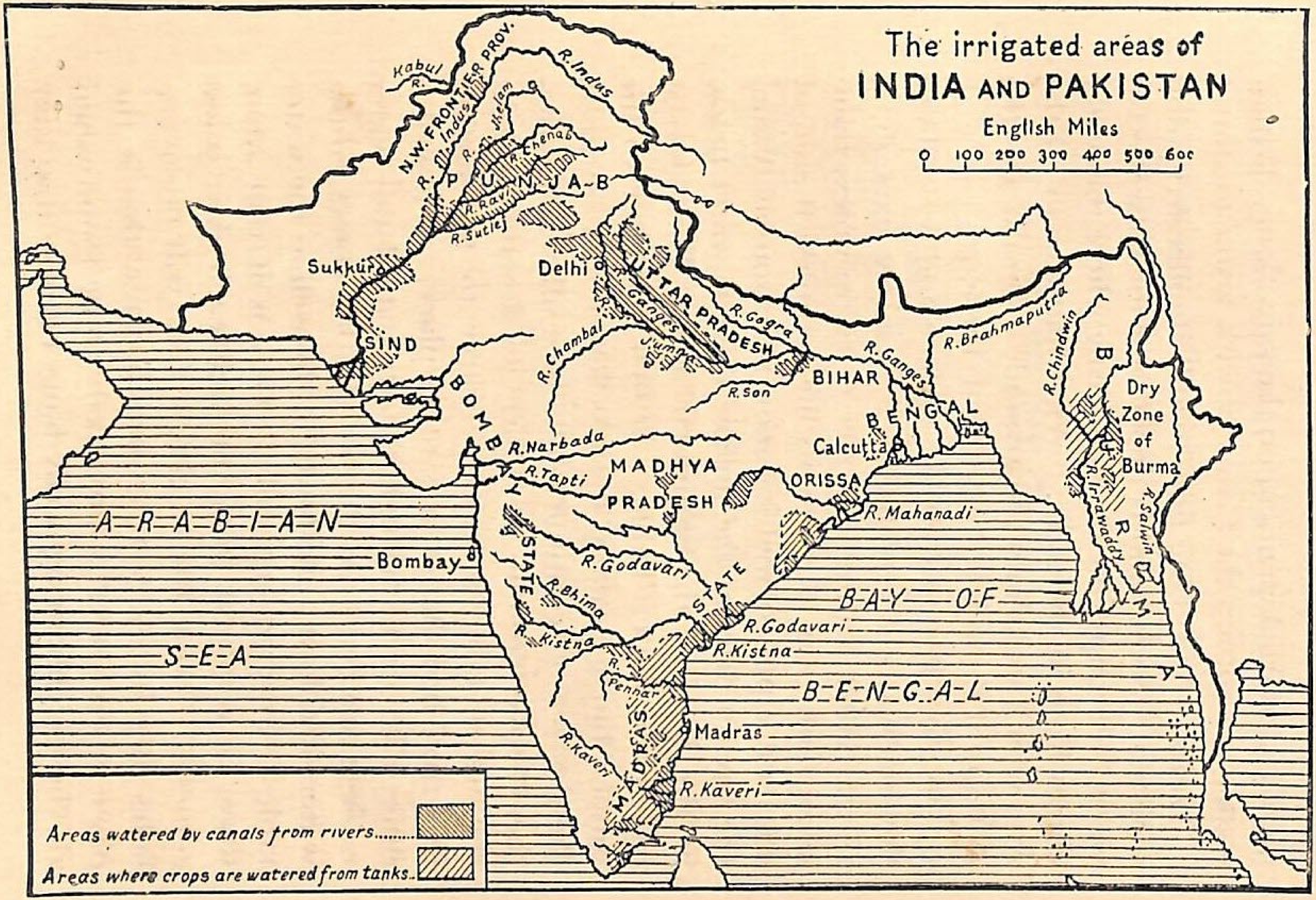

The irrigated areas of
INDIA AND PAKISTAN
English Miles
0 100 200 300 400 500 600
Kabul R.
N.W. FRONTIER PROV.
R. Indus
R. Indus
R. Jhelam
R. Chenab
R. Ravi
R. Sutlej
PUNJAB
Sukkur
SIND
Delhi
UTTAR PRADESH
R. Ganges
R. Jumna
R. Chambal
R. Gogra
R. Ganges
R. Brahmaputra
R. Son
BIHAR
BENGAL
Calcutta
R. Chindwin
BURMA
Dry Zone of Burma
R. Irrawaddy
R. Salwin
BOMBAY STATE
R. Narbada
R. Tapti
MADHYA PRADESH
ORISSA
R. Mahanadi
Bombay
R. Godavari
R. Bhima
R. Kistna
STATE
R. Godavari
R. Kistna
R. Pennar
MADRAS
Madras
R. Kaveri
R. Kaveri
ARABIAN SEA
BAY OF BENGAL
Areas watered by canals from rivers
Areas where crops are watered from tanks

Fig. 80

are valuable, since rice is a better paying crop than millet.

Wells. We come now to still smaller irrigation schemes. Some land is dependent for its water on wells. Perhaps you are wondering where the water comes from in the wells. What happens to all the rain which soaks into the ground? It saturates the soil and if there is so much that the earth can soak up no more it runs over the surface and we call the flowing water a stream, or if it is big enough, a river. After a time the river dries up unless there is constant rain to renew its life or unless there is a constant supply of melting snow at its source. When the stream dries at the surface there is water below at the level of the saturated rock. This level is called the Water Table. At first it is close to the surface but gradually it sinks lower and lower as the dry season continues but since all water, whether above ground or under it, flows downhill; the water table is always nearer to the surface in a river bed than at any other place. If a well is sunk it is bored through the rock until the water table is reached. As the hot weather comes on the water sinks lower and lower in the well as the water table is lowered generally. Why is it that when water is removed from the well each day, more comes in during the night? You will often see holes dug in a dry river bed because that is the place where water is most likely to be found when all the neighbouring wells have become dry.

Quite large areas are irrigated by means of wells in all the drier parts of both India and Pakistan, but each one can only supply water for a very limited number of fields and therefore this type of irrigation is of the least impotrance.

SUGGESTIONS FOR PRACTICAL WORK

1. Make a map to show the area under irrigation in each of the provinces shown below from the following figures. Use shades of the same colour, the darkest for the largest percentage under irrigation.

Percentage of Crops Irrigated

Bengal	7	Uttar Pradesh	28
Madras	25	Punjab	57
Bombay	4	Sind	74
Madhya Pradesh	9	Burma	8
Bihar and Orissa	22		

2. Visit any large irrigation work in your own area.
3. Make a list of the crops which are grown under, (a) tank, (b) well irrigation in your area.

Chapter IX

THE CULTIVATED CROPS OF INDIA AND PAKISTAN

Distribution of Local Crops in relation to Soil Areas and availability of Water. Have you ever made a record of the different kinds of crops grown round your school? If not try to do so in your next holiday. If you walk to school past fields, make a note of what is growing in them, when the crop is ripe, how long the land is allowed to stay with no crop at all [that is how long it is allowed to lie fallow], and what the next crop grown in that field is. This will give you some idea of the kind of things which are important in your part of the country and if you can find the reason why these particular things are grown there, you will be able to understand about the crops of parts of the country far away from your home.

When we were talking about the natural vegetation of India and Pakistan we said that a large area of the country was covered with cultivated plants, the forest had been cut down and other things, generally food crops, had been sown in their place. There are two things which matter most to the farmer when he is choosing his crop; he must know the kind of soil on his farm and also how much water is obtainable. Some plants like a rich clay soil while others do better in a sandy one and some crops are known as wet crops because they will only grow where there is a very good water supply. You must find out for yourself the kind of soil which is found round your own school and the kind of crops which will grow in it, but here are a few suggestions as to the kind of soils which plants like. You can see if they are grown in these soils in your area.

Coconuts generally like a sandy soil, especially if it is near the sea. *Cotton* likes a rich, clay soil, if possible, while *rice* is usually grown on alluvial land in river deltas. *Jute* is another crop which likes a rich soil as well as plenty of water. *Ragi* and *cholam* are content with something less and can be grown on the poorer soils. *Tobacco* likes plenty of lime and potash in the soil; while *wheat* prefers a fine clay soil.

Water supply is much the most important thing which has to be considered by the farmer in India and Pakistan. We talk of Wet Lands and Dry Lands, and Wet Crops and Dry Crops. Most land owners like to possess some of each on their farms so that if one crop fails they can get some return from another.

Rice. In the wet lands, all over the country, the most important crop is rice. This is always grown under some form of irrigation. It is a very interesting plant for many reasons. For part of its life-history it must have its roots in standing water and therefore must be grown where plenty of water is obtainable. The delta lands of the Ganges and Brahmaputra grow very large quantities of rice and smaller amounts are grown in the delta of the Indus. The deltas of the Cauvery, the Kistna and the Godavery are the places where it is most grown on the East Coast plain, and all along the strip of flat land between the Western Ghats and the sea on the Malabar Coast it is found as the chief crop. It yields more bushels to the acre than any other cereal and therefore it supports a large population. It can be reaped in about four months after sowing and if there is sufficient water it is possible for it to be grown all the year round. Most places get at least two crops a year from the same field and some even get three. In our next chapter we shall be talking about the population of India and Pakistan and if you compare the rice map with the population map you will see that there are a great many people living in the rice lands. It is a difficult crop to cultivate, it needs constant care, the young plants must each be planted out separately, the water supply must be carefully regulated and since the fields must be small and each must have a retaining wall to keep the water in its place it is not possible to use machinery to cut the grain. This means that in the rice-growing country a large number of people must be employed on the land. So you see the two things go together.

Rice, as you would expect, is the chief crop of the lower Ganges Plain since there is plenty of water and good flat alluvial soil there. As we go up the valley however we find that the amount of rice grown decreases with the decreasing rainfall.

Jute. Another important crop of the Ganges delta is jute. It is specially interesting because nearly the whole supply of the world is grown in East Bengal. It is a tall plant which likes plenty of water and does not mind having its roots surrounded by the overflowing of the river in times of flood. Like rice it needs a large population to look after it. It is cut down once a year and the stalks left to rot in the water till the fibres can be beaten out by hand. These fibres are then tied in bundles and taken to the factory to be woven into sacking or made into gunny bags. This is not a food crop you see, but the money which is paid for it enables the people to buy the rice which is grown by others near at hand. A good deal of the jute fibre is now woven in and around Calcutta and then shipped to other parts of the world, but large quantities are sent straight to Scotland and manufactured at Dundee. You can find this town in your atlas on the east side of Scotland and remember that it has this very close connection with India and Eastern Pakistan.

Sugar-cane. Another crop of the delta regions of India is the sugar-cane. Most of you have seen it growing I expect. It does not want quite so much water as rice or jute, but the soil must be rich and the temperature high all through its growth. It is also grown in large quantities, in the Upper Ganges plain under irrigation and the amount is increasing. Like rice we grow a great deal of it but use it all for ourselves.

Millet. In all the drier parts of India and Pakistan the people live on millet. This word includes several different kinds of grains such as ragi, cholam, cumbu. These plants can be grown on poorer soil than rice and do not usually need irrigation but can live on the rain alone. This is why they are called dry crops. The yield per acre is not so great as for rice and generally, since they are dependent on the rain for their water, only one or at the most two crops a year can be expected. You will notice in the population map that the millet lands do not support nearly such a dense population as the rice lands. If the rains fail in any year it is these crops which suffer most. They are grown all over the Deccan plateau and in the Punjab away from the irrigated lands as well as in the Upper Ganges Plain, that is, in all those parts of the country where the rainfall is sufficient to grow a crop at all.

Cotton. Another crop of the drier lands is the cotton. It is the most important crop grown in the western half of the Deccan, in the Bombay State and Hyderabad State. If you look back to the Geological Map you will see that this is the part which is marked "black cotton soil."

It is the area, which is covered with the old lavas, which we call the Deccan Trap. When this rock weathers it gives a sticky, black clay soil. This sticky soil does not allow water to pass through it freely and so there is enough for the roots of the cotton plants even if the rainfall is not very great. How much is the rainfall here? Look it up in the rainfall map. Cotton does not need a very great rainfall provided that its roots are planted in this kind of soil. It is grown in other parts of the Deccan, chiefly in some parts of Tirunelveli where a thick clay soil is found.

Just as jute is manufactured at Calcutta, cotton is made into cloth at Bombay. If you look carefully at your relief map of India you will see, that just behind Bombay, there are two passes over the Western Ghats which have made it easy for railways to be built on to the Deccan plateau and which carry the raw cotton to the mills in the town. Which people have the easier transport problem to solve, those who manufacture jute or those who make cotton in India?

Although the greater part of the cotton of the Peninsula is grown on the Black Cotton soil of the Deccan, some specially good types of cotton are grown in the Punjab plain but here the plants have to be irrigated. Why? They can only be grown during certain months of the year too, as cotton cannot stand frost. Which months will these be?

Wheat. The most important crop of the irrigated lands of the Punjab is wheat. This food crop is usually grown in the temperate lands of the world and it may surprise you to learn that it grows in our land. If you turn back to the chapter on the climate of India and Pakistan you will see that in the dry North-West of the Indo-Gangetic Plain the winters are really cold and that there are some showers of winter rain. The wheat is sown when the temperature falls and the ground has been softened with the autumn showers. This crop soon springs up and grows through the cold months. As the hot weather begins the grain ripens and is ready for cutting in March before the terribly hot weather arrives. Sometimes water is needed from the irrigation works to increase that which can be got from the rains. This makes it different from wheat grown anywhere else. It is important because it is a winter crop and can be grown on land which is used for cotton in the hotter months. Most of it used to be sent out of the country by the port of Karachi but it is now used at home as it is a very valuable food crop. Find, on your map, this port and the railway which brings the grain.

Tea. There is one more important crop of India and it is rather a special one for it grows only on the hills. This is tea. This plant needs a well drained soil and not too high a temperature. It does not grow well if the winters are very cold though, and so it is usually grown on the lower slopes of the hills in Assam and on the top of the Nilgiris. The plants are set out in rows on the slopes of the hills and after each shower of rain the coolies pluck the young buds which form the " tea " which we know. Since it is not easy to make roads or railways up these hills the tea is usually made in factories on the estate. It would be too expensive to pay for carriage on the freshly plucked leaf as it takes up much more space than the dried tea does. This crop is almost entirely grown for export to other countries.

Distribution. There are many other crops which are grown in our country, some of these you will know for yourselves, like groundnuts and coconuts which are specially important on the West Coast and from which the copra or dried kernel is exported to Europe to make soap. You must find out about the ones which are grown near your school but if you know the others which we have mentioned above you will know what are the chief crops and the places where they are grown. Later you will be able to learn more details but if you remember that in the Delta Lands we get rice and sugar-cane; in the Ganges Valley, rice and jute, then rice and millet, then millet, wheat and cotton as the rainfall decreases from the South to the dry North-West; that in the Punjab, wheat and cotton are the chief irrigated crops and millet the " dry crop " and that on the Deccan Lavas, the most important crop is cotton; with tea on the hills of Assam and the Nilgiris you will be able to fit in the other things as you learn them.

SUGGESTIONS FOR PRACTICAL WORK

1. From the following figures make a rice map for India. Take a blank map showing the States and colour them according to the following table:—

Percentage of the total crops.

West and East Bengal	78%
Assam	71%
Bihar and Orissa	47%
Uttar Pradesh	16%
Madhya Pradesh	26%
Bombay	5%
Madras	30%
East & West Punjab	7%

Colour those provinces with more than 70% of rice, dark green.
50—70%, light green.
With 30—50%, dark yellow.
With 10—30%, pale yellow.
Less than 10 leave white.

2. Write a description of your map.
3. Make a similar map for wheat.

Bombay	5%
Sind	11%
Madras	0%
Assam	0%
Bihar and Orissa	4%
Uttar Pradesh	42%
East & West Punjab	29%
Madhya Pradesh	12%

Use the same colours as for the rice map.
You can then compare thme more easily.

4. Compare this map with the rice one.
5. Make a similar map for cotton.

Bombay	17%
Madras	6%
Punjab	4%
Madhya Pradesh	7%

Use the same colours as for the rice map.

6. What important fact does your map show?
7. Make a similar map for millet.

East & West Bengal	5%	Use the same colours as in the rice map.
Bombay	45%	
Madras	23%	
Uttar Pradesh	12%	
East & West Punjab	15%	
Madhya Pradesh	13%	

8. Spread out all these maps in front of you and hang up a good rainfall map of India, or use the one in this book. Then try to say what effect the rainfall has on the kind of crop sown.

9. Make a diagram from the following figures:—
Take some squared paper. Rule a line 10 inches long and one at right angles to it 5 inches long. Finish the rectangle. Do this for each of the Provinces. You will then have a rectangle containing 100 rows of small squares and five small squares in each row. Colour the correct number of rows of small squares to show what percentage of each crop is grown. For example. In the Bengal rectangle you will colour 78 rows green for rice, 5 rows brown for millet and 17 red for other crops. Use green for rice, brown for millet, yellow for wheat, black for cotton, and red for " Other crops."

	Rice.	Millet.	Wheat.	Cotton.	Others.
East & West Bengal	78	5	0	0	17
Bombay	5	45	5	17	28
Assam	71	0	0	0	29
Madras	30	23	0	6	41
Bihar and Orissa	47	0	4	0	49
Uttar Pradesh	16	12	42	2	28
Madhya Pradesh	26	13	12	7	42
East & West Punjab	2	15	29	4	50
Burma	65	0	0	0	35

10. Which of these areas grows the most varied crops? Which the least varied? Try to find out what the "Other crops " are.

CHAPTER X

THE POPULATION OF INDIA AND PAKISTAN

Distribution of Settlements. When we were talking about the one inch map of your district we said very little about the towns and villages, but now we must go back to the map and look at it once more. This time let us think about the settlements, that is the places where people live, in the area shown on the map. How are houses and villages marked? In red. Look first to see whether there are many or few. Then if they are small or large. If you happen to live in a part of the country where most people get their living by cultivating the land you will probably see that there are many, many tiny villages scattered all over the map with foot-paths joining them and perhaps one or two larger market towns through which a main road or even possibly a railway passes. If the villages are fairly evenly scattered over the land we say that the population, that is the number of people who live in the villages, is evenly distributed. This is usually true if the district is a farming one.

Sometimes, however you find that there are far more red patches in one corner of the map than in the rest of it. You must try to find a reason for this. It is not always easy to find, for you must know something about the soil or the kind of work that people do there if the land is not hilly or covered with winding rivers. If the map that you are looking at is of your own district you can usually find out these things.

If the soil is poor you will find that it is not cultivated which usually means that there will be few villages and so the population will be small. In other parts it may be that the land is marshy when again there will be few villages.

On the other hand there will be places where the red patches, showing houses, are crowded together. You must try to find the reason for this too. In some maps showing towns, even small ones, sometimes there is a very crowded area in one corner while in other parts of the town the houses are more evenly spaced. You can generally discover a reason for this if you look carefully. It may be that there are some factories or mills in the crowded area. Many people will be employed in them and as they want to live near their work many houses have been built close to the factories.

Near all large towns, especially if they are Presidency towns, you will find another kind of settlement. This is often outside the Municipal limits and so the rates and taxes are less than those the city; rents are cheaper too. People whose work is in Government Offices or in large firms in the town, who need not get to their work early in the morning like the workers in the mills, prefer to live on the outskirts of the city because they find it cheaper to pay their fare each day than to pay the higher rents which are necessary in the centre of a big town. There is much more fresh air too and people can have a garden if they do not live too near the centre. Outside all large towns you find suburbs, which are similar residential settlements and in time, as the city grows, the suburbs become part of the city and then others are built further away from the centre of the town. One thing is always true of suburbs; they only grow up where there are easy means of transport to the city. Can you see why? To-day electric trains are used to bring people from the suburbs into their work in the morning and home again at night in some towns in India, while good bus services are used in almost all large cities, for this purpose. If you live near one of these towns look at the map and try to find each of these types of settlement. Those near the works where the workmen live and those further out where the officials live.

The Census. Before we go on to think about the population of India and Pakistan as a whole, let us see how population is measured. Once in every ten years a census is taken when every man, woman and child has to register his or her name on a particular day. These numbers are then collected and we are told how many people live in each town and village in the district. It would be impossible for us to remember these large numbers and so a kind of average is taken and we say that in a certain taluk the population is so many people to the square mile. If you know the area of the taluk and the number of people you can easily find the population and there are some figures at the end of the chapter to work out to make quite sure that you understand. Of course it does not mean that these people are all evenly spaced out, so many to each square mile. You can only tell how they are spaced by looking at the map and seeing where the settlements are situated.

If there is a very large town in the taluk the area of this town and the population are sometimes substracted from the total and its population taken separately; as it would make it appear that the taluk outside the town was too densely populated and the town itself too sparsely populated. Think this out for yourself.

The Density of the Population of India and Pakistan. Let us look at the population map, Fig. 31. You will see that the blackest area is in the Ganges Plain and that the population there is more than 400 to the square mile. Can you think of any reason why this should be the most densely populated part of the country? Look at the relief map and the rainfall map and you will see that all this country marked black in the population map is flat land and that near the mouth of the valley at any rate the rainfall is high. If you now look at

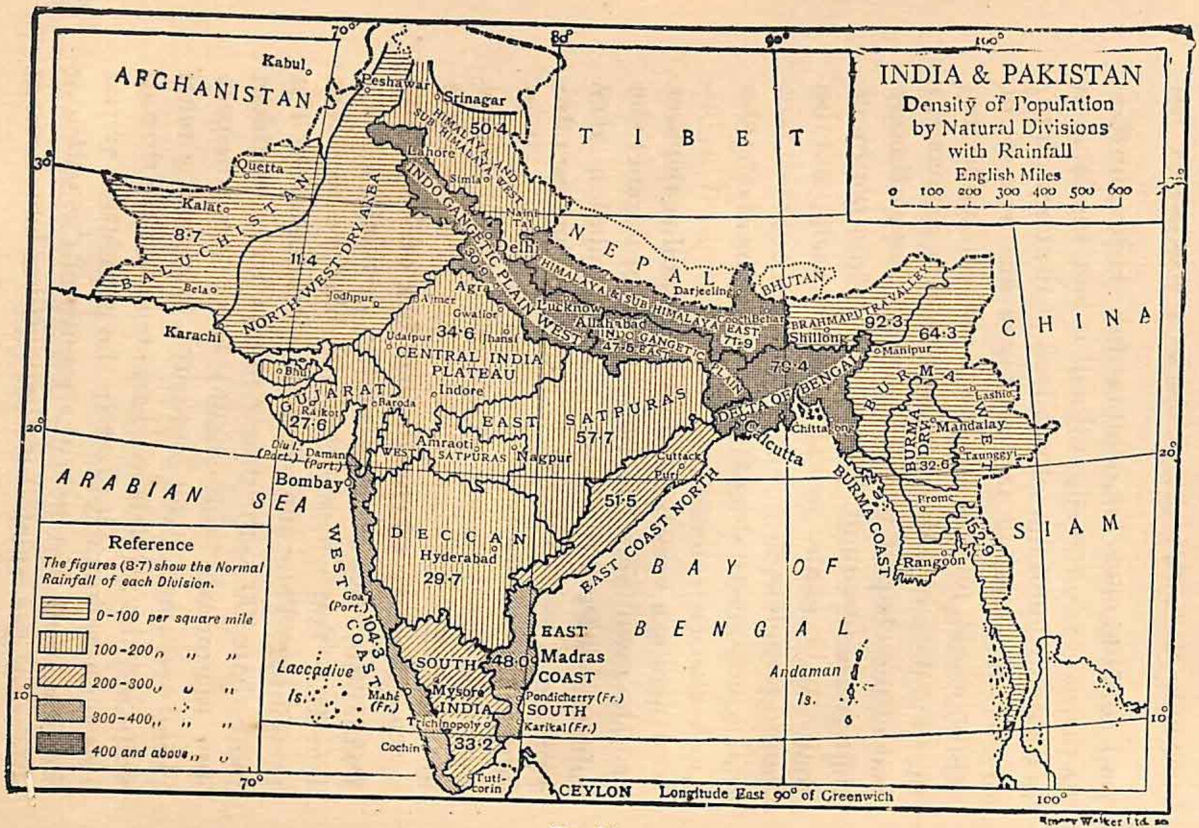

INDIA & PAKISTAN
Density of Population
by Natural Divisions
with Rainfall
English Miles
0 100 200 300 400 500 600
Reference
The figures (8·7) show the Normal Rainfall of each Division.
0-100 per square mile
100-200 " "
200-300 " "
300-400 " "
400 and above " "
AFGHANISTAN
Kabul
Peshawar
Srinagar
Quetta
Kalat
Bela
Karachi
BALUCHISTAN
8·7
11·4
NORTH WEST DRY AREA
Jodhpur
HIMALAYA AND SUB HIMALAYA WEST
50·4
Lahore
Simla
Naini Tal
INDO GANGETIC PLAIN WEST
30·9
Delhi
Agra
Ajmer
Gwalior
Udaipur
34·6
Jhansi
CENTRAL INDIA PLATEAU
Indore
Bhuj
GUJARAT
Rajkot
27·6
Baroda
Diu (Port.)
Daman (Port.)
Bombay
WEST SATPURAS
Amraoti
Nagpur
EAST SATPURAS
57·7
DECCAN
Hyderabad
29·7
WEST COAST
104·3
Goa (Port.)
Laccadive Is.
Mahé (Fr.)
SOUTH INDIA
Mysore
Trichinopoly
Cochin
33·2
Tuticorin
EAST COAST SOUTH
48·0
Madras
Pondicherry (Fr.)
Karikal (Fr.)
EAST COAST NORTH
51·5
Cuttack
Puri
TIBET
NEPAL
BHUTAN
HIMALAYA & SUB HIMALAYA EAST
71·9
Darjeeling
Cooch Behar
Lucknow
Allahabad
INDO GANGETIC PLAIN EAST
47·5
DELTA OF BENGAL
79·4
Calcutta
Chittagong
BRAHMAPUTRA VALLEY
92·3
Shillong
64·3
Manipur
BURMA
BURMA DRY
32·6
Mandalay
Lashio
Taunggyi
WET
Prome
Rangoon
152·9
BURMA COAST
CHINA
SIAM
ARABIAN SEA
BAY OF BENGAL
Andaman Is.
CEYLON
Longitude East 90° of Greenwich
10°
20°
30°
70°
80°
90°
100°
Emery Walker Ltd. sc

Fig. 31

the irrigation map, Fig. 30, you will see that further up the valley where the rainfall is less, the land is well irrigated and now if you look at the crop maps, you will see that all this area has heavy crops of rice or wheat, millet and cotton. This is important, for in some countries the land which is given to agriculture is the land which is least thickly populated, but in India the land where plenty of food can be grown is the land which supports the densest population.

The next most densely populated areas are the South-East and the West Coast Plains. On the West we have a heavy rainfall, you will remember and the conditions are something like those of the Ganges Plain, but the strip of flat land is very narrow. In the Ganges Plain the population becomes less as the rainfall decreases. On the West Coast the population decreases as the highland of the Western Ghats is reached. Again you see it is less as soon as it becomes difficult to grow a plentiful supply of food.

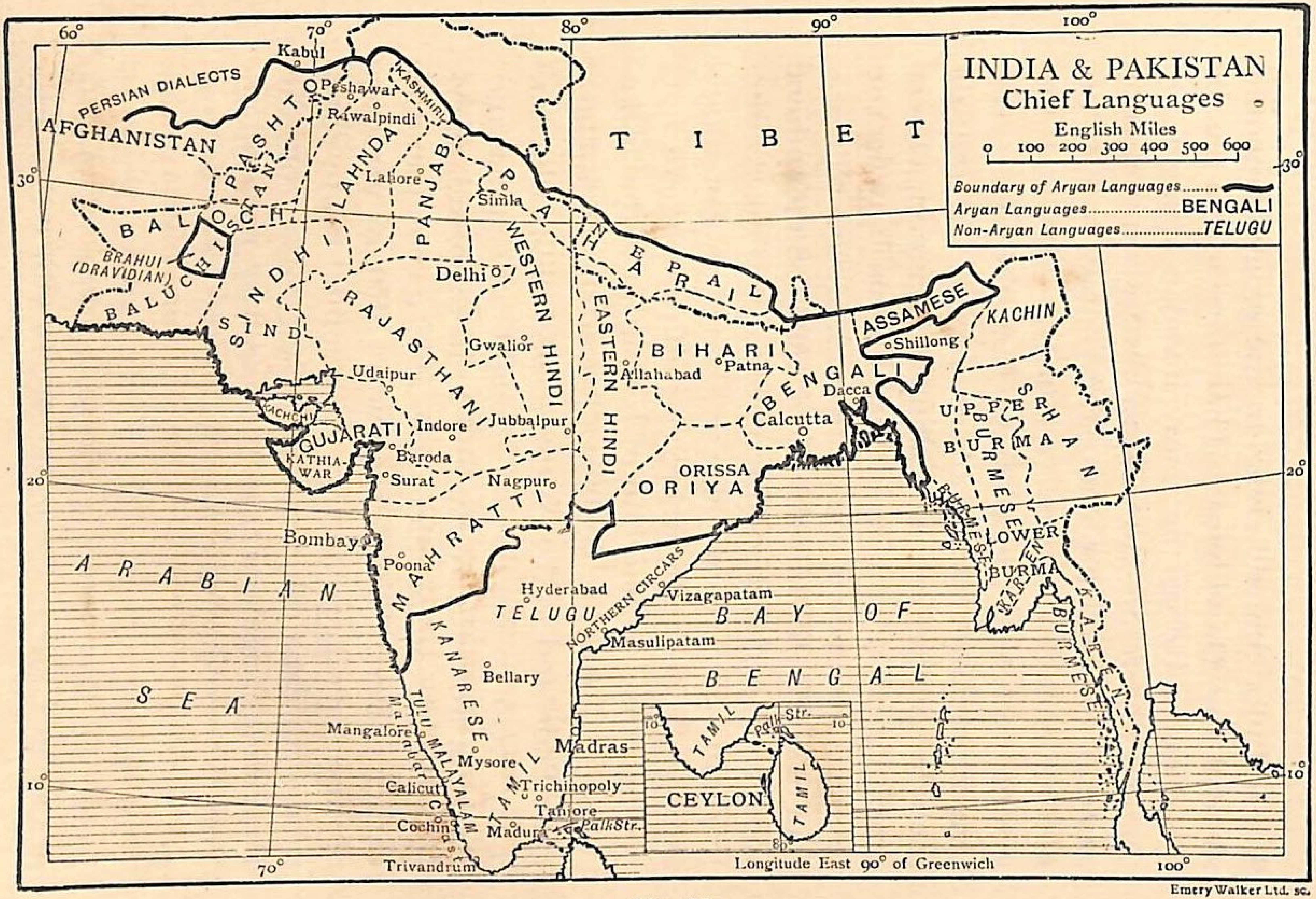
Can you say why the South-East Coast Plain should be so well populated? Here the rainfall is not so very great, is it? Look again at the irrigation map, Fig. 30, and you will see that this part of the plain has much Tank irrigation and so once more it is a question of the possibility of growing plenty of food. The North-Eastern portion of the coastal plain has nearly as dense a population, 200—300 per square mile, while the plateau lands of Mysore have the same. If you compare this map with the rainfall one I think you will see the reason.

Now look at the Deccan. There the population is considerably less, only 100—200 to the square mile. The rainfall is low and the soil poor, so it is difficult to grow much food in any of this area. What is the chief food crop? Millet. Wherever you find that the people have to live on this instead of either rice or wheat you will find that the population is small.

Now we come to the most sparsely populated area of all. The North-West of Pakistan is either very dry or very hilly or both and so we should expect to get a poor population, should we not? Since 1947 the population of both India and Pakistan has changed by movement from one country to the other. It is also increasing rapidly but what has been said in this chapter is true in general.

The Population of India and Pakistan According to Language. In these two countries we find many different kinds of people, speaking different languages and having different customs. The reasons for all these differences are not easy to find for they are the result of the history of the country and you will have to look for them in your history lesson. Here we can only say what is true to-day.

There are two main classes of people who differ in race in the country. Most of the people of the



INDIA & PAKISTAN
Chief Languages
English Miles
0 100 200 300 400 500 600
Boundary of Aryan Languages
Aryan Languages........BENGALI
Non-Aryan Languages........TELUGU
TIBET
AFGHANISTAN
PERSIAN DIALECTS
Kabul
Peshawar
Rawalpindi
KASHMIRI
PASHTO
LAHNDA
PANJABI
Lahore
Simla
PAHARI
NEPALI
BALOCHI
BRAHUI (DRAVIDIAN)
BALUCHISTAN
SINDHI
SIND
Delhi
RAJASTHANI
WESTERN HINDI
EASTERN HINDI
Gwalior
Udaipur
Indore
Jubbalpur
KACHCHI
GUJARATI
KATHIA-WAR
Baroda
Surat
Nagpur
BIHARI
Allahabad
Patna
BENGALI
BENGAL
Calcutta
Dacca
ASSAMESE
Shillong
KACHIN
UPPER BURMA
BURMESE
SHAN
LOWER BURMA
KAREN
ORISSA
ORIYA
MAHRATTI
Bombay
Poona
Hyderabad
TELUGU
NORTHERN CIRCARS
Vizagapatam
Masulipatam
KANARESE
Bellary
TULU
MALAYALAM
Malabar Coast
Mangalore
Mysore
Calicut
Cochin
Trivandrum
TAMIL
Madras
Trichinopoly
Tanjore
Madura
Palk Str.
CEYLON
ARABIAN SEA
BAY OF BENGAL
60°
70°
80°
90°
100°
30°
20°
10°
Longitude East 90° of Greenwich
Emery Walker Ltd. sc.

Fig. 32

South India States belong to the group of people we call the Dravidians. They were probably in the country before the many invaders came from the North of the Himalayan ranges through the passes, into the rich plain of the Ganges. They do not all speak the same language. You can see where most of them speak each of the four great Dravidian languages in the map, Fig. 32, but all these languages have something in common. Their grammar is very much alike and if you have learnt to speak one when you were a child you will not find it very difficult to learn each of the others though the script is so different that it is not easy to learn to write them. These Dravidian languages are spoken in the Southern part of the plateau.

The other great group of languages is the Indo-Aryan. These are spoken all over the Indo-Gangetic Plain and in the Northern part of the plateau. They seem to have been brought into India and Pakistan from the North and to have spread wherever the Aryan peoples were able to conquer the earlier settlers. There are many different varieties of these languages but they have something in common with each other and differ far more from the Dravidian languages than they do from each other. You can see from the map where the chief of them are spoken.

In the hill regions of the North-Eastern corner of India we find some languages spoken which are nearer to Chinese than they are to either the Dravidian or the Aryan group of languages. This is what we should expect as there are a few passes in the North-Eastern corner of India leading into China; but since they are much more difficult to cross than those of the North-Western corner in Western Pakistan, the people from Tibet and China have never invaded the peninsula in such numbers and their language has not spread in the same way that the others have done.

SUGGESTIONS FOR PRACTICAL WORK

1. Make a population map of India and Pakistan for yourself from the following figures:—

State.	*Density of Population per square mile.*
Assam	143
Baluchistan	8
East Bengal	
West Bengal	
Bihar and Orissa	409
Bombay	157
Madhya Pradesh	139
Coorg	81
Madras	298
North West Frontier Provinces	172
East and West Punjab	207
Uttar Pradesh	444
Madhya Bharat	115
Hyderabad	150
Kashmir	40
Mysore	208
Rajasthan	76

Colour those provinces with more than 600 to the square mile black.
400—600, purple.
200—400, dark blue.
100—200, light blue.
Less than 100 leave white.

2. Take the map of your own district and trace from it the red patches which show the position of the villages. Is the population evenly distributed or not? If not try to see why this is.
3. If you live near or in a large town make a list of the suburbs and try to find out where most of the people work who live in each of them.
4. Get the Census Report and find the area of several villages near your town and the population. From these two sets of figures work out the density of the population near your school. Is it something like that which is given for the taluk as a whole?

CHAPTER XI

THE NATURAL REGIONS OF INDIA AND PAKISTAN

The meaning of Natural Regions. What do we mean by the Natural Regions of a country? The divisions into which Nature has divided it, is the first answer that occurs to us, I suppose, but we must look at it a little more closely. Sometimes the natural and political divisions more or less coincide with each other, but often they do not. We will choose a political unit which contains parts of several natural regions to show what we mean. Suppose that we live in the Madras State. Some of us live in Madras City others of us live on the Malabar coast. Some live on the Nilgiri Hills; while still others live on the Deccan, at Bellary or at Cuddapah. Now we all live in the Madras State, that is in the same Political Division of the country, but we each live in a different Natural Region. The people who live in Madras expect their rain in October and November, and arrange their year's work in the fields accordingly. They cultivate rice and water their fields from tanks. Those who live on the Malabar coast are also farmers but they have to arrange their working year quite differently. Their rain comes in summer and it is very heavy. They grow rice but do not need to irrigate their fields from tanks for the rainfall is sufficient for all their needs. They are specially interested in growing coconuts and many of them get all their living from growing and exporting the copra and coir made from them. On the whole these people are richer than those of the East Coast for the good rainfall makes the cost of working the land less. The people who live on the Nilgiris lead quite a different kind of life from those about whom we have been speaking so far. Their climate is different you see, and their land is not flat and easily ploughed as it is in the plains. They have to get all the rice which they eat from the lowland and pay more for it than those who can grow it round their home. Tea is the crop which they are most likely to grow, and instead of living in villages and cultivating the land around, they live on large estates, agreeing to serve for a definite time after which many of them return to their own village on the plains. Those who live on the Deccan plateau live in yet another way. They are mostly cultivators again, but this time the rainfall is so little and the soil so poor that rice is seldom the most important crop, though some may be grown if there is water to be had from some tank or well. Here the people are generally too poor to import it, as the dwellers on the tea estates do, so they must live on what they can grow. Most of them eat various kinds of millets, which they call dry crops. If the rains are good they may live a fairly comfortable life, but they often fail and then the lot of the farmer is a hard one. If he has not been able to store up food from the previous harvest both he and his family may starve.

You will see from all this that the life of man in the different Natural Regions varies according to the region. What is the thing which makes the greatest difference? It seems to be climate; especially rainfall, does it not? This is certainly true in India, but climate is not the only factor to be considered. Soil and the relief of the land (whether it is flat or hilly) have to be taken into account. The occupation of the people is dependent very largely on these three things, especially in our country where so large a proportion of the population are engaged on the land. We should say therefore that a Natural Region is one in which the structure, soil and climate are more or less the same and in consequence the natural vegetation and crops and the occupation of the people are also the same. Now let us look at the larger Natural Regions of India and Pakistan in turn.

THE HIMALAYAS

Structure. This great mountain wall to the North of India and Pakistan forms the first of these larger Natural Regions. We say that the Himalayas are Fold Mountains. Do you know what this means? Take a large duster and spread it flat on the table. Then put two heavy books one on each side of it; now put your hands on the books and push slowly towards each other. What happens to the duster? It wrinkles up into folds, does it not? These folds are parallel to each other and there are " valleys " in between. Now if you look at the map you will see that there are parallel ranges of high mountains all along the Northern frontiers of India and Pakistan with deep valleys containing large rivers between the " folds." We think that at some time great pressure was brought to bear on the rocks of this part of the world and the crust of the earth was pushed up, very, very slowly, so slowly the movement could not have been seen if there had been anyone living on the surface of the earth, to see it. It seems probable that some movement is still going on for we sometimes get bad earthquakes in this part of the world and in other regions where fold mountains occur.

How the mountains came to be formed is not very important for our purpose, but you should know something of the part which they play in the life of the people of this land. There are very few who actually live amongst the mountains, but those who live far away from them benefit greatly from having them there. Let us see how this can be.

A Mountain Barrier. If you look carefully you will see that the Himalayas are very high indeed and that they stretch right round the northern boundary of India and Pakistan. The highest mountains in the world are here and this is important for us. India has always been separated from the rest of Asia by this barrier. It is true that there are some passes through which people have come, but they are so high and difficult to cross that only hardy, strong men have been able to do it. This means that weaklings have been kept out of our land.

But a much more important result of their great height is the climatic one. In Central Asia the winds are terribly cold and as the Himalayas, and the other ranges which are parallel to them, are so high, and since they have no valleys of any size opening into the plain, these cold winds can find no way into India. If you look at the map of China for a moment you will see that many of these parallel valleys open into the plains of China and so they get their great rivers frozen in the winter. We never have this. Please remember this point, for people sometimes think that the plains of Northern India and Pakistan are cold because they are near the mountains; whereas they are really much warmer because of the protection which this great wall gives.

If the cold winds of Central Asia do not come into India, the warm, wet, winds of the Monsoon do not cross the mountains into Tibet so that India gets all the rain which they bring, too.

The Snow-line. At the top of these very high mountains it is so cold that the snow never melts. You remember that we said that the temperature decreases as we go up a mountain at the rate of about 1° for every 300 feet. If Mount Everest is 29,000 feet high how much colder is it there than in Calcutta? As we come down the mountain again the temperature increases and when we reach the point where it is 32° or slightly over, the snow turns to water. This is known as the snow-line. In the winter it is further down the mountain than in the summer. Why? It is also lower on the North side than on the South. Can you see why this is? Now since there is always some point on the slope where melting is taking place, however hot it is on the plains, it means that the streams which rise in these snow-clad mountains have water in them the whole year round. This is a great help to the plains at the foot of the Himalayas as we shall see later.

The Vegetation of the Mountain Slope. As we leave the snow-line behind us we come to a part of the mountain which is covered with small plants, mosses and stunted shrubs and tiny flowers. This is very like the Tundra vegetation about which you heard when you were in the Lower School. It is too cold, and the winds are too strong for anything as large as a tree to grow.

Lower down again we come to the great coniferous forests of the Himalayas; these trees are like those found south of the Tundra but they are of very little use to man for they are still very high up on the mountain slope.

Below this belt again we come to a different kind of forest. Here the trees are evergreen oaks. They make splendid trees but the timber cannot be used for it would take a very long time and be a very expensive business to try to bring the wood down to the plains where it could be cut for building or other purposes.

The chief reason for the difficulty of this is the fact that lower still on the slopes we come to tropical forests through which it is very difficult to cut roads, the trees grow so closely together and the vegetation is so luxuriant that if it is cut down it soon grows again. It is hot and steamy for the rainfall is heavy along the greater part of the foot-hills of the Himalayas, so that this region is not a healthy one.

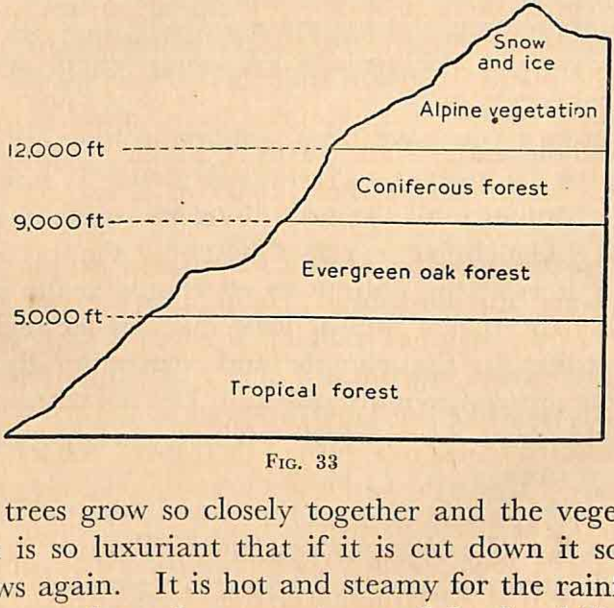


Fig. 33

The Population of the Region. There are very few people living in all this Natural Region. A few villages are scattered about on the lower slopes and there are a few towns at certain points along the range about 7,000—9,000 feet above sea-level, such as Darjeeling, Simla and Murree, which have been built as a kind of summer holiday home for people who have to work hard in the plains and find it necessary to get into a cooler climate for the very hottest months of the year. At these points railways and good roads have been built up in the mountain zone, but for the most part there are no railways and few roads in the whole length of the Himalayas.

Perhaps you have been wondering how we can call the Himalayas a Natural Region. It has the same structure all the way along its length, has it not? The climate is very different at the top from what it is at the bottom so we should really sub-divide the region into at least five smaller regions according to the climate and vegetation found. These sub-divisions are shown in Fig. 33, which you should draw for yourself and try to remember. They are:

1. The Region of Snow and Ice.

2. The Alpine Vegetation Region. (The small plants which grown in this region are called Alpine plants because they were first found in the Alps in Europe.)

3. The Coniferous Forest Region.

4. The Evergreen Oak Forest Region.
5. The Tropical Forest Region.

SUGGESTIONS FOR PRACTICAL WORK

1. Put into a blank map the main ranges of the Himalayas and the ranges parallel to them with the rivers in between.
2. Draw a map of the Indo-Gangetic Plains with the Himalayas to the north. Put in the direction of the summer wind in red and of the winter wind in black. This will remind you of the value of the mountains as shelter for the plain.
3. Trace a map of the North-Western ranges. Name them and show the passes through them.

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CHAPTER XII

THE INDUS PLAINS

The Indus Plains. South of the great Himalayan Mountains we see the Indo-Gangetic Plain. You will notice that it stretches from west to east right across the country. In structure it is the same, from one end to the other. At one time, very long ago, it was a great arm of the sea, but when the land gradually rose and the mountains were formed; rivers soon began to cover it with the sand and silt brought down from the mountains to the north and the plateau to the south. If you have a good physical map of India and Pakistan you will find that there is a part near the middle which is coloured yellow because it is more than 600 feet above sea level. This forms the water parting between the two valleys. We will talk about each one separately because although they are alike in structure they differ in climate and so in crops as well.

Since 1947 the Indus Plain has been divided politically into West Pakistan and the East Punjab province of India. In this chapter we shall take them together because we are talking about Natural regions and these two political units are very much alike in their geographical features.

The Indus Plain to the West of the water parting, is formed by the silt brought down by five rivers. Find out their names from your map and learn them. The easiest way to do this is to put them into a map of your own. All the rivers rise in the Himalayas and this is very important for the country through which they flow. Can you see why?

The Snow-Fed Rivers of the North-West. On the Himalayas the snows are found all the year round. These rivers rise high up in the mountains and so they begin as ice-rivers or glaciers. When they reach the snow-line, the ice melts and as this happens every day of the year there is always plenty of water in the rivers lower down their valleys. This is very important, so be sure that you understand it before you go any further.

In the summer months, when the sun is high in the sky, the snows melt more quickly so there is likely to be more water in the river than in the winter. It is at this time too, that the mountains are getting their rain by the summer monsoon, which is another reason why the river is specially full then. What happens in the lower part of the river valley when all this extra water is being poured in high up in the mountains? There are floods, sometimes very bad ones, and whole villages are swept away.

When a river is in flood it often changes its course. This happens in the Indus valley. One year the river will be flowing in one channel and then after the next flood it may be flowing in quite a different place. Two things happen as a result of this. Large towns are not built close to the river for fear that they might be carried away when the river changes its course. The river cannot be used for carrying goods, that is for navigation. If the river is constantly changing its direction it will leave sand-banks behind when the flood-waters dry up and no boats can be sure of finding enough water.

Irrigation from these Rivers. If the rivers are useless for navigation they are of great use for another reason. This is the driest part of the subcontinent, is it not? Look at your rainfall and temperature maps and you will see that it is not only dry but very hot so that any rain which does fall will very soon be evaporated again. The rivers have water in them all the year from the melting snow. In the summer there is always an extra amount of water owing to the floods. If a large dam is built across the valley this flood water can be saved and then it can be sent by canals to water the land, often far away from the river.

The Jhelum, the Chenab, the Ravi and the Sutlej all have great irrigation works in their courses. These canals and their distributaries (the smaller canals leading from the main one to the fields) water millions of acres of land in the Punjab. Without this water the land would be barren, no crops would grow and no people could live there. The waters of the Indus are used to irrigate the Sind Plains, below the junction of the five rivers.

The Sub-divisions of the Indus Plains. The Indus Plains can be sub-divided into four main regions. The first three form the West Punjab, of Pakistan and the East Punjab of India the land of the five rivers; the fourth the plain of Sind which lies wholly in Pakistan. This last one is the Indus valley, below the point where all the tributaries meet the main stream. You can see the divisions in the map, Fig. 34. Half the region of the Northern Plain and the whole of the S. W. Punjab

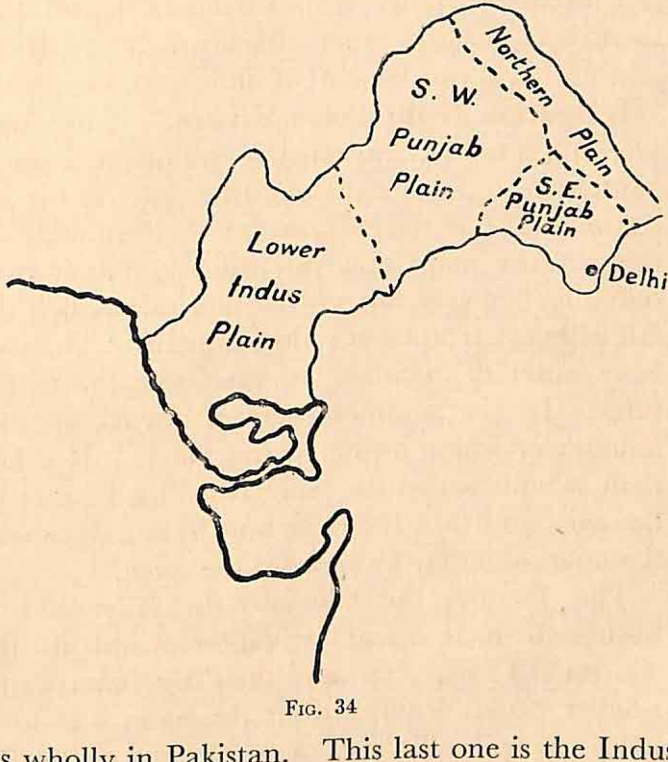

FIG. 34

Plain and the Lower Indus Plain belong to Pakistan. The Eastern half of the Northern Plain and the S. E. Punjab Plain belong to India.

1. *The plains near the foot of the mountains in the valleys of the four tributaries.*—Here, close to the hills the rainfall is better than in the rest of the Punjab, and crops can usually be grown without irrigation. What are these crops likely to be? Mostly millet, as food for men, and some fodder for the animals which draw the plough. There are plenty of wells in this region which are used to water the crops; as well as the rain.

2. *The South Eastern Plain stretching from Delhi to the Sutlej.*—The rainfall, here, is not quite so good as in the last region. It is also very uncertain, and some years it is good while in other years it is bad. If the rains are good it is possible for crops to be sown and reaped, but in bad years the grain is sown and perhaps never reaped at all. But there is a good system of canals which take the water from the Sutlej river, and so the people no longer have to worry so much about the "bad years."

3. *The S. W. Punjab Plain.*—The third region covers the greater part of the Punjab. Here the rainfall is so small that no crops could be grown at all without the water brought by the canals. It is here that the change is greatest. Before the building of the irrigation works the land was parched and dry, almost desert. Now it is covered with growing crops for most of the year. In the winter

wheat is grown. This grain likes cold weather during its early growth and showers when it is springing up. You will remember that this area has great extremes of climate. Therefore although the summers are hotter than in any other part of India or Pakistan, the winters are cold enough to grow wheat. It is important to remember this because wheat is usually thought of as a crop of the Temperate regions of the world. It needs dry hot weather to ripen the ears, and the temperatures of the Punjab spring are about the same as those of the Temperate summers. The wheat is reaped in March before the very hot weather begins.

Another crop which is grown on irrigated land is cotton. This is different from the cotton of the Deccan. It is "long stapled" cotton. This means that the fine threads which cover the cotton seed are longer than those which grow near Bombay. Only "long stapled" cotton can be used for the finer kinds of cloth. It is important for India that she can now grow for herself on irrigated land this fine cotton which before had to be imported from America.

4. *The Sind Valley.*—This is the valley of the lower Indus. Have you ever wondered why the Indus receives no tributaries in the long stretch from Sukkur to the sea? It is because the rainfall on the hills to the west is so small. This whole region would be desert, like the Thar on its eastern border, if it were not for the irrigation from the

river. The Indus is a strange river for it has less water at its mouth than higher up its valley. Do you know why this is? So much of its water is lost by evaporation and so much more is removed by irrigation canals that by the time it reaches the sea it has not a great deal left.

The crops of this region are all grown by means of irrigation. They are much the same as those of the other divisions of the plain except that a certain amount of rice is grown, mostly in the delta lands.

The Population and Towns of the Indus Plain. You will easily see that the people of this great plain are mostly cultivators, for they live in small villages wherever there is sufficient water for their crops. Very few of them live in towns. You can find and put into a map the following ones and try to find why they are important: [Your history book will help.] Lahore, Amritsar, Multan, Delhi and Karachi, the port of the Indus Valley and the capital of Pakistan. These are the chief towns and of these Delhi and Karachi are the most important. We shall talk about Delhi, the capital of India in the next chapter.

SUGGESTIONS FOR PRACTICAL WORK

1. Make a diagram on squared paper to show the crops of the Punjab.

Rice	3%
Wheat	28%
Millet	12%

Other Food Crops	23%
Cotton	8%
Fodder Crops	15%
Other Crops	11%

2. Make a similar diagram for the Sind Valley.

Rice	25%
Wheat	12%
Millet	34%
Other Foods	9%
Cotton	7%
Other Crops	13%

CHAPTER XIII

THE GANGES AND LOWER BRAHMAPUTRA PLAINS

WE have talked about the Western end of the great Indo-Gangetic Plain and now we are going to turn to the more fertile Eastern part of it. There are really four large sub-divisions of this area, which we will talk about in turn, from West to East.

The Upper Ganges Valley. Look at your map and find Delhi. Where is it? If you have a relief map you will see that it is on the slightly higher ground between the Indus and Ganges valleys. We call this the *watershed* between the two river systems.

For many years Delhi was the capital of India, and if you think you will see why. It lies on the watershed so it is easy for people who travel up each of the rivers to meet there. It lies to the East of the Thar desert, and as all roads must come round the desert, the route from the West coast will reach the Ganges valley just at Delhi. This means that three roads and two river routes meet there. If a town is to be the head of the Government of a country, it must be in such a place that it iseasy for people from all over the country to get to it. If you look at Fig. 35, you will see that this is true for Delhi. That is one reason why the capital was changed from Calcutta to Delhi sometime ago and has remained as the capital of the new India.

Now find Allahabad, at the point where the Ganges and the Jumna meet. We generally say that the part of the Ganges Valley from Delhi to Allahabad form one Natural Region and call it the Upper Ganges Valley. If you look back to the

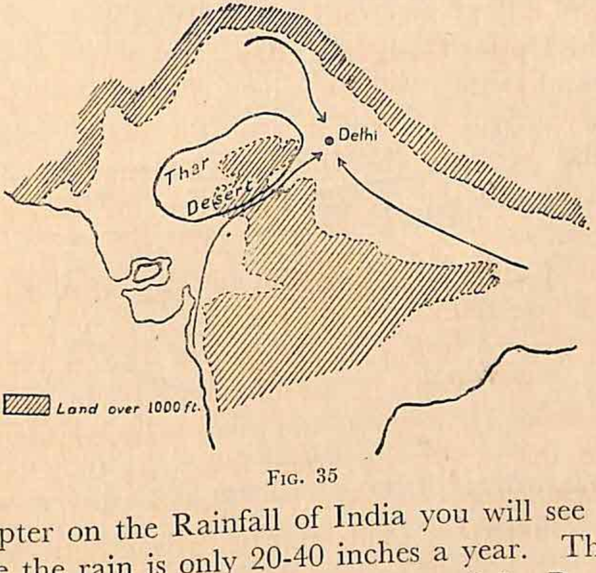

FIG. 35

chapter on the Rainfall of India you will see that here the rain is only 20-40 inches a year. This is about the same as the wettest part of the Punjab. You will not therefore be surprised to learn that in this part of the Ganges Plain there is a great deal of irrigation. The large tributaries of the Ganges as well as the main stream all rise in the Himalayas and so are snow fed rivers. This makes irrigation easy as we said in the chapter on the Punjab. What do you suppose are the chief crops? Cotton and wheat are the two most important, though millet on the drier lands and fodder crops for the cattle are very largely grown as well.

The Middle Ganges Plain. From Allahabad to the point where the Ganges changes its direction and turns South is generally called the Middle Ganges Plain. The soil is just the same as it was in Sind, the Punjab and the Upper Ganges Plain—that is, a fine silt brought down by the rivers without a rock or even a stone in it for miles and miles—a great stretch of level plain with rivers flowing slowly across it. In flood time, of course, the river flows swiftly, and can be dangerous to life. Why? Near to the river there is grassy land, used only for grazing sheep or goats; but away from the fear of floods the whole land is one great sea of grain. This is especially true of this natural region where

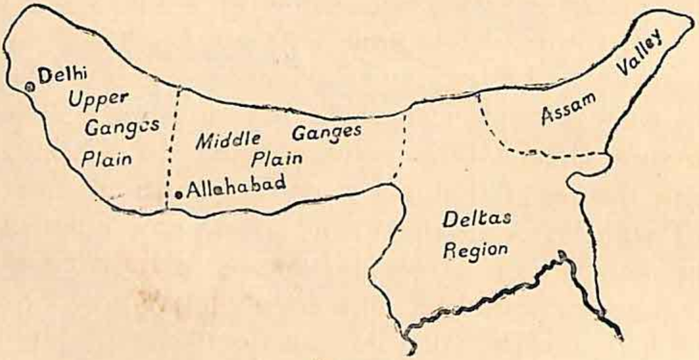

FIG. 36

there is much less need for irrigation. Can you say why? The rainfall is as much as 40-60 inches a year, and the wetter parts of this region are wet enough for the growth of rice. If we take the crop returns we find that rice forms about half the grain crop, and wheat and barley the other half.

The Lower Ganges Plain. Beyond the southward turn of the great river we come to a region which is different from any which we have spoken about before — the Delta of the Ganges and the Brahmaputra. Do you remember what a delta is? If you have forgotten, look up the chapter on rivers at the beginning of the book. It is here that the river is building up its bed most rapidly. The streams change their courses from year to year, with the result that old river beds are sometimes left with water in them, and form lakes often of the most curious curves and shapes. All these formations are found in the Ganges delta lands.

This part of the valley is famous for two crops. It is here that jute is grown more largely than in any other part of the world. This crop is grown very largely in the Pakistan province of East Bengal. It is largely manufactured in West Bengal. It is a tall reedy plant which needs much water and a high temperature. When it is tall enough, men cut it down, tie it in bundles and leave it in the water to rot the outer covering of the stems. You can see how useful all the streams of the delta are for this purpose. When the outside covering has been removed the fibres are washed clean and taken to the factory to be woven into the cloth from which gunny bags are made. This kind of fibre is used for making cheap carpets and rugs, sacks for storing grain and tarpaulins for covering stacks of grain. You can tell from this how much is used in a country where so much grain is grown as in the Ganges Plain.

But jute sacking is used all over the world where grain crops are grown. People in Europe and America need it. All of this jute comes from the Ganges delta. Some of it is made into cloth in many small towns towards the north of Bengal and sent away to all parts of the world from the great port of Calcutta. Some of it is shipped from the same port as " raw jute." That means that it is sent as fibre, ready for making into cloth in some other country. The place where a great deal of it is made is Dundee in Scotland. It would be interesting if you could find out why raw jute should be sent all those many miles away to be made into cloth. Ask your teacher or look it up in the Encyclopædia in the school library.

The Growth of Calcutta. We have said that jute is made in the nearby towns and that it is shipped from Calcutta. This town has grown to an immense size during the last 250 years. Let us try to find out a little about it. We said that the rivers change their course very readily in a delta. This is true and therefore it is rather strange that such a large town should have grown up. It still costs a great deal of money to keep the Hooghly, the particular stream of the Ganges on which Calcutta stands, sufficiently free of sand for ships to use the channel. Special pilots have to take ships up this river from the sea. They have to be very, very careful for the sandbanks shift so much that every few months the charts have to be changed. Only a man who knows the river very well will be able to take ships safely through such a difficult way. Ocean-going steamers can get right to the port although Calcutta is 80 miles from the sea. Why has it been worth while to spend so much money in making a town on such an artificial site?

We say that Calcutta is the outlet port for all the Ganges delta. The soil is so rich, the crops are so good that in spite of the great population of the whole valley there is some extra grown above the amount needed by the people who live in the Plain. Other people in other parts of India and of the world need this extra supply. There must be some place where the surplus goods, not needed at home, can be collected and packed and sent away to those who do need them. Calcutta is this place.

It is situated at the highest point on the river to which ships that are used on the great ocean routes can come. Here the goods can be brought, in the old days by the small river boats or along the roads of the plain; but now mostly by railway from all parts of the great Ganges Plain. Here they can be packed straight away into the holds of the ships which will carry them to Madras, Rangoon or further afield. The fewer times that goods have to be handled the cheaper they are to send, so it is a great advantage that all the goods of this area can be collected so easily in one place and shipped straight away in ocean-going vessels.

The people who live in the Ganges Plain feel that they need some things which other parts of the world can supply. The mills in Calcutta which turn the jute fibre into cloth need machinery to weave the fibres. The flour mills which make the wheat and rice into flour need machinery. Some people like to wear silks and cloths which have been made in other parts of the world. Oil is needed in every village to light the lamp at night and that must come from abroad, for none is found in India. Wood to build houses and make furniture cannot be found near at hand. All these things and many more are brought to Calcutta to pay for the wheat and rice and cotton and jute which are sent away. There must be large offices where this exchange of goods is made and banks where the money transactions can be carried on. In this way Calcutta has become so great a town, full of business offices and banks, shipping offices and wharves. It is because the Ganges Plain is so rich and therefore can afford to do so much trade that it has been found worth while to spend so much money in making the artificial port of Calcutta. If the town is known as the Outlet Port of the Ganges Plain, the plain is known as the Hinterland of Calcutta. Remember this word for you will come across it often.

The other important crop of the delta is rice. We call this the "Food Crop," jute being the "Money Crop." Can you understand what we mean by these two names? Rice is grown all over the delta where the water supply is constant and does not need to be stored in reservoirs as in some other parts of India.

The Sunderbands. Close to the coast the soil is being constantly renewed, and the delta grows further out into the Bay of Bengal every year. There are practically no roads at all, and people move about from place to place by boat. There are great forests of mangrove trees. This swampy land is gradually being reclaimed and the trees cut down. When this is done it makes good paddy land.

The Assam Valley. When we get to the far Eastern end of the Indo-Gangetic Plain we really leave the Ganges Valley and enter that of the Brahmaputra. We take them all together because the lowland is continuous and the two rivers have a common delta. This lower end of the Brahmaputra is called Assam. It is a much narrower valley than that of the Ganges as you can see from the map. Look carefully and you will see that there is a range of hills to the South of the river, and then another valley with the river Surma running through it, which joins the delta of the Ganges and Brahmaputra. So that there are really three sub-divisions here.

The Assam Valley is the wettest place in the world. If you take a sheet of paper and draw a line for the Himalayas and another for the Khasi Hills you will see that they meet at a point in the North East and that the two lines form a kind of funnel. In the summer when the South-West Monsoon is blowing it is drawn up this funnel with great force, and the wind rising to cross the hills is cooled and the moisture falls (as rain) in great torrents. The average rainfall is 400 inches a year in this valley, and there have been as much as 900 inches in a specially wet year. People who live on the Deccan or in West Pakistan cannot imagine such a heavy rainfall.

This wet valley is an uncomfortable place in which to live, at least for the summer months, but it is the most fertile part of Assam, and rice is the chief crop.

On the hills to the south, tea is grown and is one of the crops which is sent out of the country through Calcutta. Tea is a money crop, for nearly all of it is exported. We shall hear more about the growth of tea when we are talking about the Nilgiris, but meanwhile remember that Assam is famous for its tea plantations.

The Surma valley is not so wet as the Assam valley. Can you see why? It is very like the delta land of Bengal and grows the same kind of crops.

Rainfall and Crops in the Indo-Gangetic Plain. We have now travelled from West to East through the most fertile and the most densely populated part of the country. As we came from West to East we passed from the driest to the wettest part of the land. If you have followed carefully, you will have noticed that as the rainfall has increased the kind of crops have changed. In the Punjab wheat is the chief food-crop, with cotton the most important non-food crop; in Bengal and Assam the chief food-crop is rice, and the most important non-food crop is jute. In the middle Ganges valley, where the rainfall is mid-way between that of the Punjab and that of Bengal, the amount of wheat and rice is about equal. This is a very important thing to remember. In some parts of the world the rainfall does not play so large a part in the life of the people as it does in India and Pakistan, and although even in these countries both soil and temperature help to decide which crop a farmer shall grow, much the most important factor is the amount and the time of the rainfall.

SUGGESTIONS FOR PRACTICAL WORK

1. Trace a map of the Indo-Gangetic Plain and insert the boundaries of the following States: Assam, East and West Bengal, Bihar and Orissa, Uttar Pradesh,

East and West Punjab and Sind. Colour each of these to show the percentage of the crops which are grown under irrigation, as given: Assam 0%, East and West Bengal 7%, Bihar and Orissa 22%, Uttar Pradesh 28%, East and West Punjab 51%, Sind 74%.

2. Write out in one or two sentences what this map shows you.
3. Trace another map like the last one and colour it for the percentage of the total area sown under rice: Assam 71%, East and West Bengal 78%, Bihar and Orissa 48%, Uttar Pradesh 16%, East and West Punjab 2%.
4. What do you learn from comparing these two maps?

CHAPTER XIV

RAJASTAN AND MADHYA BHARAT

WE shall leave the Northern Plains now to learn a little about the different parts of the Deccan plateau. We will begin with the North-Western corner. Look at the map and find the large state of Rajastan. Your relief map will show you that to the South East the land is fairly high, then running in a S. W.-N. E. direction there is a range of hills called the Aravalli Hills which stretches right across the state. To the North and West of this range the land slopes down to the Indus Plain. This North-Western slope forms the Thar Desert.

The Thar Desert. You have heard about this great desert in the chapter on the climate and you can turn back to that to find out why it is so very dry. In the year the rainfall is only about 10 inches, and the temperature is extremely high in hot weather. There are great stretches of sand where nothing will grow except perhaps a few shrubs with fleshy leaves or a blade or two of grass. The land is rocky and uneven and is quite impossible to cultivate. You may say that in Sind the rainfall is no more and yet they are able to grow quite good crops by means of irrigation. Why is it possible to irrigate the plain of Sind and not to do anything in the Thar desert? One look at your map will answer this question — in Sind the Indus river flows, in the Thar region there are no rivers

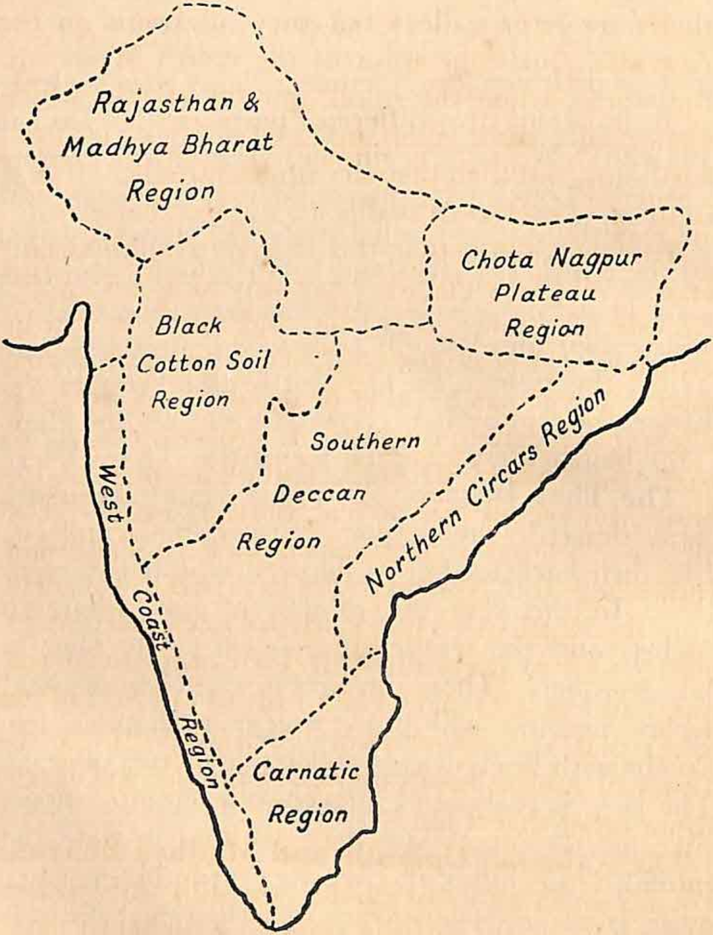

FIG. 37

at all. The Sind valleys slopes down from the Himalayas and although the valley itself is dry, the rivers begin high up in the mountains which are covered with snow all the year round. In the Thar there are river valleys but they all begin on the Aravallis and slope towards the North West. In the storms when the small amount of rain which comes, falls, these valleys may be full of water for a few hours, but then they dry up for months. There is no snow on the Aravallis.

You may think that this is a very unimportant area. Why should we hear anything about it? No one lives there, it is true, and no crops can be grown so it is of no use to the country in providing food. Yet it has a value of its own. A desert is a great barrier. No one can cross it easily, all roads pass round its ends, and it is such an inhospitable region that no one wants to own it. For all these reasons it has helped to keep Peninsula India and the Northern Plains apart. Invaders from the North-West had no desire to cross its sandy wastes and so they all made their way down the rich and fertile Ganges Plain instead of crossing on to the plateau. Deserts very often act in this way. You will find other examples of this as you learn about other desert lands.

The Rajastan Uplands and Madhya Bharat. To the south and east of the Aravallis the land is hilly and broken, but the rainfall is higher; therefore there is some chance of growing crops and of people being able to make a living. There are not many people here. The rainfall is sufficient in a good year to grow millet and perhaps a little wheat, but during a bad year there is often famine, and the country is too hilly and the soil too poor for irrigation even if water could be found. The soil is made from the old hard crystalline rock of the Deccan plateau which you will remember always gives a poor, thin soil. You see how very different the conditions here are from those in the Indo-Gangetic Plain.

Routes. This region lies between the Indo-Gangetic plains and the Deccan Trap cotton growing area. The railways from the West Coast and Bombay in particular have to cross it. You have learned that it is much easier to build a railway over a plain than over mountainous country. Unfortunately, the lower part of this region, which would be the easier route for roads and railways, is the driest. This is the Thar Desert. Look in your atlas and find the railways which skirt (go just round the edge of) the desert. The line from Karachi to Delhi goes round the southern end and then along the foot of the Aravallis. Another line runs from Delhi to Bombay, south of the Karachi-Delhi line. Find the line which joins Agra, Jhansi, Bhopal and Bombay. Which valley does it use?

SUGGESTIONS FOR PRACTICAL WORK

1. Trace a map of North India and put in the area which we have been talking about in this chapter.

2. Colour the land over 600 ft. yellow.
   600 to 1,200 ft. light brown.
   Over 1,200 ft. dark brown.
3. Draw in the outline of the Thar Desert. You can find this from the Rainfall map; it is roughly the same as the area with less than 10″ of rain a year.
4. Now draw very carefully the railway lines about which we spoke in the last paragraph.
5. Write an account of the map which you have drawn.

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CHAPTER XV

THE DECCAN

The Black Cotton Soil of the North Western Deccan. Turn to the map on page 127 and you will see the area about which we are going to talk now. It is sometimes called the Deccan Lavas Region. Do you remember why? This is a land of deep, rich, black volcanic soil. Cotton is easily grown on it and over nearly the whole plateau is the most important crop.

Look at the rainfall maps on pages 82 and 84 and you will see that the rainfall is low, not so low as in Rajastan perhaps, but certainly not a good rainfall. Can you see why this is? The greater part of the Deccan Lavas region lies on the eastern side of the top of the Western Ghats. What difference does this make to its climate? We say that it lies in the rainshadow of the Ghats. The result is that the rainfall is very much less than on the Western Coast.

If this is so why is it that such good crops of cotton can be grown? Cotton likes plenty of sunshine, and if there is much rain the sky is cloudy and the plants do not get enough sun. The cotton needs some water of course, how does it get it? When the rain falls it is stored in the sticky black clay. It is generally possible to find some patches of clay soil, wherever we live. If you have a chance see some of it and find out what it looks like and how it behaves in the rainy season. You will soon discover that rain does not run away so easily on clay as it does in a more porous soil. The roots of the cotton plant are able to use the water which is stored up in the soil. A much lower rainfall will be sufficient to grow the crop if the soil keeps the water a long time.

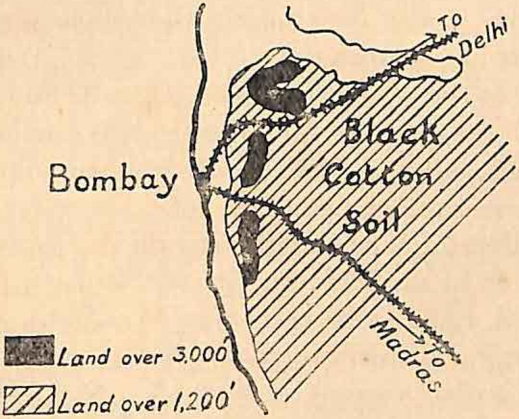
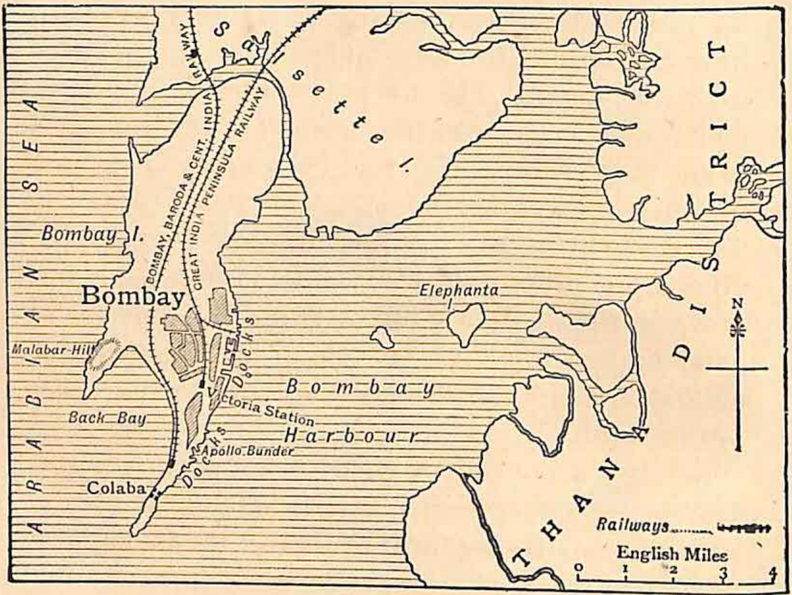


FIG. 38

The cotton which is grown here is known as short-stapled cotton. This means that the fibre which is found round the seed in the pod or boll is comparatively short. It is shorter than that grown either in the Punjab or in America. It can only be used for rather coarse cloth but it is extremely useful to the mills in Bombay.

Bombay. When we were talking about the

Lower Ganges Valley we said a good deal about Calcutta as the outlet port for the whole valley. Bombay is the outlet port and the manufacturing centre for the Deccan Lavas region. Look carefully at the map and notice that the hinterland of



Emery Walker Ltd. sc.

FIG. 39

Bombay is not nearly so well connected with its port as Calcutta and its hinterland. What separates them? The Western Ghats. If you look well you will see in the Ghats just a little to the North of Bombay there is a gap. It is not very low but it is low enough for a railway to be made up it on to the plateau. This is very fortunate, for on the plateau we get the black soil and the large crop of cotton. The cotton growers are able therefore to send their crop by train at comparatively little expense to the coast.

When it reaches the coast it can be shipped away to other parts of the world very easily. Bombay has a beautiful natural harbour. Calcutta has to have its channel dredged all the year but Bombay is always clear. The town is built on an island which acts as a protection from the stormy winds fo the S. W. Monsoon so that even in the very worst weather ships can anchor safely there. Now do you see why it is so important that gaps in the Ghats should not only lead to the cotton fields but down to the harbour? Bombay has the only really good harbour on the West Coast and the two gaps behind Bombay are the only ones for many miles to the south.

Bombay is not only a great cotton port, it is also a great manufacturing centre. Since it is on the West Coast it is easy for it to import the machinery and coal which are needed to work the factories. These are both heavy articles so it is better to carry the light cotton down from the plateau to the port than to carry the coal and machinery up to the plateau. That is why Bombay acts as the manufacturing centre as well as the port for the cotton lands.

The Population of the Region. Although this region has such a good chance of growing cotton it cannot grow much else except millet. Why? Look at the rainfall map again and you will understand. The population is therefore much smaller than that of the Indo-Gangetic Plain, although larger than that of Rajastan and Madhya Bharat. The towns are not very large or important. What do they do? Can you think for yourselves? Poona is the largest of the inland towns. Find it on your map and notice that it lies just at the head of the gap leading from Bombay to Madras.

The Upper Mahanadi and Chota Nagpur. This is the north eastern corner of the Peninsula just as the Lavas region was the north western. The two are very different. Let us try to see where the difference lies. The relief is broken hilly country with deep river valleys cutting into the plateau. This has made the construction of roads and railways difficult, and cuts Chota Nagpur off from other parts of India.

The climate is much better than that of the last region about which we were speaking. Which way does the rain-bearing wind blow? From the south-east, and since it has to rise to cross the hills the country is well watered. It is therefore covered with good forest trees. Forests are not easy to cross and so that is another reason why this part of India is cut off from the rest. The country is very beautiful with its forested hills and steep-sided valleys, but it is difficult to cultivate. There is not enough level ground to grow any large crop and the higher parts are covered with forest.

All this has led to its being one of the most backward regions of our country. The population is very small and consists mostly of primitive Hill Tribes who live their own kind of life. They care nothing for the ways of the rest of the world. They have been cut off from the rest of India by the geography of their country and they live a life entirely their own.

The coal-fields. On the eastern slopes of the Chota Nagpur plateau we find the best coal in India. It seems strange after what we have said about the isolation of this part of the country to find on its edge some of the busiest areas in India. Find Ranigunj and the river Damodar. At several places along this river it has cut down to the coal-bearing strata which are worked all along the valley. Some iron and other minerals are found in this region. Where does the coal go? Mostly to Calcutta and the other manufacturing towns of Bengal, but a great deal is now being used to smelt the iron ore and to make the steel of Jamshedpur. This district is becoming very important as India tries to increase her own supply of iron and steel and machinery.

The Southern Region of the Deccan Plateau. This includes the two great States of Hyderabad and Mysore and a part of Madras. Hyderabad is partly in the Lavas Region. Beyond this area the land is not nearly so rich. It lies sufficiently far south to be in the rain-shadow of the Western

Ghats and gets little or no benefit from the south-east wind which brings such abundant rain to the Chota Nagpur Plateau. Look at the rainfall map and see this for yourself. Not only is the rainfall small but its coming is uncertain. This eastern half of Hyderabad is one of the worst regions of India for drought and famine. The soil is poor as it is only derived from the hard, old, crystalline rocks of the Deccan, the rainfall is low and the crop is millet which is the grain that can be grown anywhere in India or Pakistan if there is enough rain to grow a crop at all.

South of Hyderabad lies Mysore where there are several good irrigation works, especially that on the Cauvery. This scheme, which waters many acres of land which was a few years ago only capable of growing ragi and millet, has made it possible for rice to be grown in large areas.

One of the interesting things about Mysore is that it contains the largest goldfield in India, at Kolar.

Mysore is the highest part of the Deccan Plateau and it is therefore cooler than the coastal plains. The climate is pleasant and many retired people settle there, in Bangalore. The southern end of the plateau forms the Nilgiri Hills. These are as much as 8,000 ft. high and so have a very much colder climate than any part of the plains. Ootacamund is a hill station to which many people go for the hottest months of the year.

South of the Nilgiris the peninsula narrows very quickly and this most southerly part of the plateau is divided from the Nilgiris by the Palghat Gap. Find this on your map and notice the railway which passes through it. It is the only easy way from East to West across India, south of Bombay.

The slopes of the Nilgiris and the Annamalais have been planted with tea. The rainfall is sufficient because the hills are high enough to get a good rainfall. The wind blows through the gap with great violence during the S. W. Monsoon but it is a dry wind so that all the low-land of the plateau is dry.

SUGGESTIONS FOR PRACTICAL WORK

1. Get some clay and some sand. Put each into a tall glass and fill it with water. Then stir both glasses up thoroughly. Watch the particles sink to the bottom and time them to see how long the water takes to clear. Can you say why one takes so much longer than the other?
2. Fit a filter paper into each of two funnels. Fill the funnels with clay and sand respectively. Put each under a tap and let the water fall in a steady drip on to each. See which comes through the funnel first. Can you see any connection between the first experiment and the second?
3. Draw a map of Bombay and its hinterland. Show on your map why the town is so important.
4. Trace as large a map of the Chota Nagpur Plateau as you can find. Make a relief map by tracing the contours of 600 and 1,200 and 3,000 ft. Colour it and put in

the rivers. Then add the direction of the prevailing wind in summer. What do you notice?

5. Find Ranigunj and Asansol and the river Damodar, put them into another map. Then trace the railways of the area. What do you notice?
6. Find something in your history books about the hilltribes of the Chota Nagpur Plateau.
7. Draw a Railway map of the Southern Region of the Deccan Plateau. Say why there are so few railways compared with those of the Indo Gangetic Plain.

CHAPTER XVI

THE WEST COAST REGION

ON the West coast of India we find a very narrow plain. The Western Ghats come down steeply to the sea leaving a small strip of level land which is being built up from the sand brought down by the rivers and washed up by the waves of the sea. Look at your largest map of the Peninsula and find the following things:—

Close to the shore there is a line of sand banks which have been formed from the sand brought down by the rivers and washed to and fro by the currents of the Indian Ocean. Turn back to the chapter on rivers if you have forgotten about this.

Behind the sand-banks you will see a long line of back-waters. How have these been formed? By the holding back of the waters of the rivers by the sand-bars at their mouths. They are very important to the people who live on this coast. Look at your map carefully and see how many small streams cross the narrow coastal plain from the Ghats. If you tried to build a road you would have to build a bridge over each one of these. That would be very expensive, so the people do nearly all their travelling by boat along the backwater.

Behind the backwater there is a small strip of flat land where people grow paddy and coconuts. This is very rich land. Can you see why? It is made up of the sand and silt brought down by the small streams and so it is constantly renewed. If you look at the rainfall map of India you will see that this part gets a large amount of rain, over 80″ a year. The southern part of it gets some by both monsoons and this is the richest part. The more northerly part although it gets so much rain is sometimes in need of water. Can you see why? Such a large part of it flows back into the sea by means of the many rivers that it is lost. The back-waters are open to the sea so they are salt and cannot be used for irrigation. But while all this is true you must not think of any part of the West coast as being in need of water like the Deccan. It is a well watered country.

Behind the narrow coastal plain we come to the lower slopes of the Western Ghats. Here the people grow pepper vines and other spices such as used to be the chief export of India in the early days of trading by sea.

This is a most interesting part of our country because it is so different from any other. When Vasco de Gama found the sea route to India he landed on this coast. In those days the ships were very small and he was able to find shelter in the harbour of Kozhikode or Cochin. These places are built at natural openings in the sandbank along the shore and are large enough for small vessels. Cochin has been artificially deepened and has been opened for large vessels within the last twenty years. Those early sea-traders came to Kozhikode; bought their spices and fine silks and muslins, then sailed away back to the West again. They never saw any other part of India. To-day the people who live on that West Coast strip seldom have anything to do with other parts of the country. Can you see why?

This is a region which we say is naturally isolated. What was the other one about which we spoke? Chota Nagpur. This West Coast Region is better off in many ways than the Chota Nagpur plateau. It has a good rainfall, plenty of money coming in from the coconuts of the shorelands and the paddy of the plain and easy connections with other parts of the world by sea. Its people are some of the most advanced in India in matters of education. But it has very poor connections with the rest of the country.

Look at your map again and find the railway through the Palghat Gap. You will see that it runs a short way south and short way north along the coast and then there is no direct connection with Bombay at all. Why is this? Because it costs so much to build bridges across the many streams of the region. The Western Ghats act as a wall dividing this part of India from most of the rest.

Now that Cochin Harbour has been improved so that large sea-going vessels can use it the people of the West Coast are able to export the tea of the Nilgiris and the Annamalais and the teak of the slopes of the Western Ghats as well as the many coconut products which before had to be sent away by train, from Cochin.

SUGGESTIONS FOR PRACTICAL WORK

1. Draw a railway map of this region.
2. Read the story of Vasco de Gama in your Library Period, you will find it in any book of discovery stories.
3. Make a list of all the things which you use that are made from the products of the coconut palm.

CHAPTER XVII

THE EAST COAST REGION

LOOK carefully at the map and notice that the East Coast plain is a good deal wider than that on the West Coast and that although there are backwaters in places they are not nearly so continuous as on the West Coast. The important thing to notice here is the number of large deltas. Why are there no large deltas on the West Coast? Because the rivers are so short that they do not bring down enough silt to form a delta.

The Sub-Divisions of the Plain. The East Coast plain is generally divided into two sections, the Northern Circars region and the Carnatic. What is the chief difference between them? They are both plains or rather part of the same plain; they grow more or less the same crops, why should they be considered separately? If you look back to the chapter on climate, you will see that the Circars region gets its rain with the S. E. wind, which brings moisture to the Ganges Valley in the hot months of the year. The Carnatic differs from all other parts of India by having its chief rain from the North East wind in the cooler part of the year.

Madras City. There are two important parts of this area, the district round Madras and the Cauvery Delta. When we were talking about Calcutta and Bombay we were able to say exactly which part of the country formed the hinterland to each town. We cannot do this with Madras. We must look to our history books to find the beginnings of Madras. There is no easily discovered natural reason why it should have grown where it has. The harbour is a very poor one and not safe in bad weather. The town is not at the centre of any natural routes, nor at the centre of a particularly rich agricultural region. How then did it come to be? It began as the trading town for the East India Company, who built a fort to protect their factory from the French. The town began to grow around the fort which you can still see to-day. In time, small villages were linked with the Fort by good roads and as it became safer to live outside the protecting walls, people built their houses along these roads. So the town grew.

As Madras was the centre of the East India Company's government it remained the governing centre after the East India Company was no more. It is important now because it contains the Government Offices, the chief Banks, the University, the Law Courts and the head offices of the great firms who carry on business with this part of India. They all came here because the town was the seat of government. Madras is a good example of an artificial rather than a natural centre. History gave it a start and it has continued to grow.

The Cauvery Delta. This is a very rich agricultural land. The river provides plenty of water for irrigation and brings down plenty of silt to renew the soil from year to year. Since the opening of the Mettur Dam, further up the river, water has been obtainable even during the dry months of the year and this has become one of the richest rice growing areas in India. Tanjore is the most important town in the region. Tiruchirapalli is a very old town, situated at the head of the delta. Look carefully at your map and notice that the river divides here, so that it is the last place where one bridge would cross the river, below Tiruchirapalli two at least would have to be built. You often find a town at the last point at which a river can be bridged. If you look well you will see that several main roads and railways meet here. Which are they? Which came first—the road or the railway? Does this explain why the main line from Madras to Ceylon should have to pass through Tiruchirapalli? What do you mean by a chord line? Try to answer these questions for yourselves.

The Northern Circars Region. This region stretches from a little north of Madras to Orissa. The southern part ofit is an area of poor rainfall. Why? It lies between the North East Rainfall region and the South East Rainfall region and gets least rain of any part of the East coast. Rice is seldom grown except round tanks. The chief crop is millet and the people live in much the same way as those of the Deccan plateau.

Further north, the rainfall increases as we come towards the South East Monsoon area of Orissa and as the rain increases the amount of rice grown becomes greater too.

The Godavari and the Kistna are building out a great delta into the Bay of Bengal. Each has its port, Masulipatanam near the mouth of the Kistna and Kakinada near the mouth of the Godavari. Why do we say near to the mouth of a river which reaches the sea through a delta? For one thing it has more than one mouth. But chiefly because the sand and silt brought down by the river make it impossible for a town to be built very close to the river itself. Both these ports are small ones. Why? They have no natural harbour so that vessels using them have to stay out at sea, several miles from the shore. The sand brought down by the rivers causes the water near the shore to be too shallow for large vessels to be able to come close to the land. Only comparatively small coasting steamers call at these ports.

SUGGESTIONS FOR PRACTICAL WORK

1. If you live near a port, plan an expedition to see the Harbour.
2. Draw a map to show the routes which meet at Tiruchirapalli.

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CHAPTER XVIII

THE POLITICAL DIVISIONS OF INDIA AND PAKISTAN

WE have been talking in the last few chapters about the Natural Regions of our country, and we have taken little or no notice of the political boundaries. Why was this? Because the political divisions may often be quite artificial and it is difficult to learn anything about a country unless we can find first what that country is like without man's interference. Now we will spend a short time looking at the political divisions.

District or Taluk Boundaries. Most States are divided for Government purposes into Districts and these again into Taluks. The boundary lines seldom have any relation to the natural features of the countryside. If you can get a map of your taluk, it is a good exercise to trace the rivers and streams off it. Then draw the water-parting, that is the line which divides the area drained to one stream from that drained to the next. If you do these in black and then trace the Taluk boundary in red you can see how far the boundary corresponds to any natural boundary. In areas where the land is comparatively flat the Taluk boundaries seldom bear any relation to valleys or watersheds. In more hilly country they tend to follow the crest of the hills. You must find out for yourselves, whether yours does or not.

Get a map of your State and make a list of the Districts. Then say to which Natural Region each belongs. You will find that the boundary sometimes cuts across two natural regions so that part of the District belongs to one and part to another. There is always one town in each District which acts as the head town. Here the government offices are found and the District is named after it. Find the District town for your own district and then see how good the means of communication are that lead to it. In some cases you will find that this town is a natural centre for a very large area of country, or the meeting place of many good roads and railways. In others you will see that the head of the District is little more than a market town for the local area. Coimbatore and Tiruchirapalli are examples of the first type and Nellore and Chingleput of the second. You must find out all you can about your own district and try to see how far it is typical of the Natural Region to which it belongs. These towns have been chosen from Madras but you can find equally good ones whether you live in Bombay or West Bengal or Pakistan.

The States of India and Pakistan. You have learnt a good deal about the different States in your history lessons, I expect. Take a good physical map of India and Pakistan and put it beside a political one. You can then see that the following statements are true.

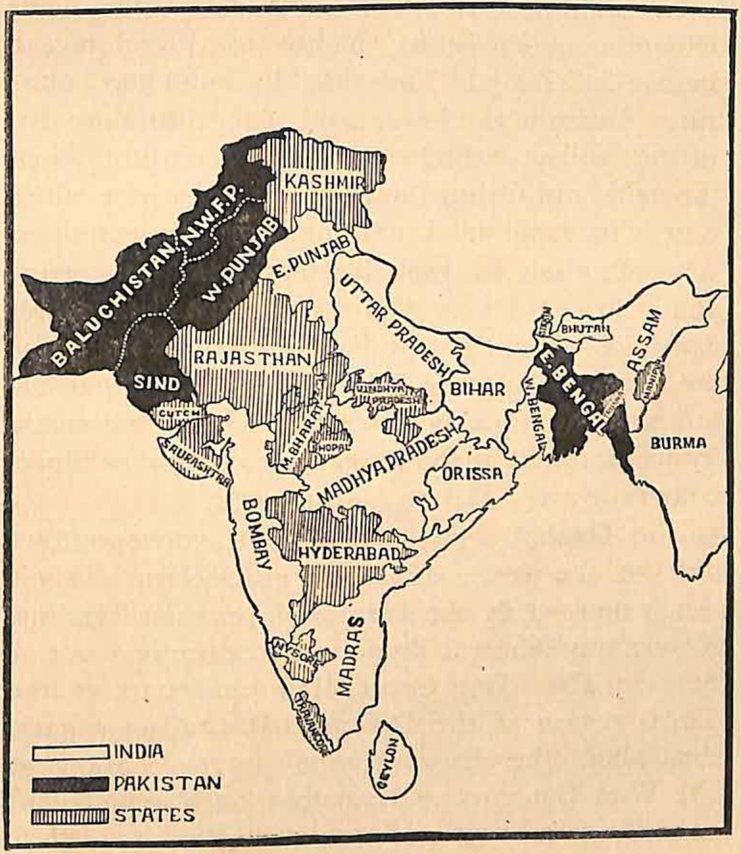

Fig. 40
Political Divisions of India and Pakistan

In the Indo-Gangetic Plain, the provinces correspond fairly well to the natural sub-divisions except that the deltas region is divided by India and Pakistan, the older, western part belonging to India and the newer Eastern part, where the river is still building up its bed and increasing its delta, belonging to Pakistan. At the other end of the plain, the " Punjab " is divided by India and Pakistan. Assam is the lower part of the Brahmaputra valley. Bihar is the lower Ganges plain just above the delta and Orissa the most northerly part of the East Coast plain. Find out about the State of Uttar Pradesh in your history book. It corresponds to the Upper Ganges plain. The Punjab is the " Land of the Five Rivers," that is, the country which is watered by the Indus and its tributaries. This is partly governed by India and partly by Pakistan, while the lower Indus valley, or Sindh belongs to the Pakistan Government.

The Bombay State occupies the corresponding strip on the west coast, north of Cochin. This is much more truly a natural division than Madras. How many Natural Regions are concerned in this State? The West Coast plain and part of the Lavas region of the Deccan. We talked a good deal about the city of Bombay in the chapter on the West Coast so you can look back to that and read it again to refresh your memories.

The Madras State occupies the Eastern coastal plain, part of the Western one and a small part of the Deccan. The boundaries are purely political ones and have little or no relation to the Natural boundaries about which we have been speaking in the last few chapters. The Madras city was the first British settlement to get thoroughly established on this coast and therefore it naturally became the chief town of the province. It is fairly centrally placed but it is difficult for the people who live on the West Coast to take a very great interest in the ways and doings of the people who live near Madras. Does this make it easier or harder to govern the province?

Madhya Pradesh forms the greater part of the North-Eastern corner of the Deccan Plateau, with Nagpur as the central town and the head of the province. This is an important town because it is about equidistant from the three great ports of India, Calcutta, Bombay and Madras and so railway routes from all three meet here.

On the borders of Pakistan we have the two provinces of Baluchistan and the North West Frontier Province. These are wholly in the dry hill region on the west of the Indus plain. They are important for the routes which pass through them, rather than for anything which they produce themselves. It is here that we find the great passes, through which the invader has come, down into the fertile plain of the Ganges for centuries, hoping that he will find an easier life in the rich plains than in the barren hills of his own country.

The States of the Deccan. A large part of the Deccan is occupied with the two great states of Mysore and Hyderabad. Each is ruled by its own ruler, the Maharajah of Mysore and the Nizam of Hyderabad. Both lie in the rain-shadow area of the Western Ghats, but Hyderabad has the advantage of a fairly large area of black-cotton soil and Mysore has good irrigation works on the Cauvery. Mysore is 2,000 feet above the sea-level and in parts as much as 3,000 feet. This gives it a cooler climate than the rest of the Deccan so that it is looked on as a health resort by people living in Madras. Bangalore has many retired officials, who find here a pleasant climate in which to spend the leisure days of their lives.

Rajastan is another large state on the dry edge of the plateau, you can look back to Chapter XIV to see what was said about it there for it corresponds to one of the larger Natural Regions.

Kashmir on the north of the Indus plain is a very mountainous state, the most beautiful and fertile part of which is the Kashmir Valley. It is the great fruit growing region of India and you can buy apples, apricots and nuts in most large towns of India, which were grown in this beautiful valley.

The Communications of India and Pakistan. Look at your railway map and see that the part of the country where most are to be found is the Indo-Gangetic Plain. Why is this? There are more people living here than in any other part and therefore the goods which have to be sent from one place to another are many more than in other parts of the country. It is the richest part of India and again the quantity of goods to be moved will be greater here than anywhere else. The land is flat, so railways are easily built. Can you see anything that would be a difficulty here? The many rivers would have to be bridged and that is an expensive business. However the value of the goods sent is sufficient to pay for the cost of building the bridges. You will not be able to remember where all the lines of the Indo-Gangetic Plain go but take a blank map and put in the following towns and the railways which link them together; *Calcutta*, about which you already know quite a lot; *Patna*, the capital of Bihar; *Banaras*, the sacred town on the Ganges, the centre to which so many pilgrims go year by year; *Allahabad*, the town which has been built at the junction of the Jumna and the Ganges. Can you see why a town should be likely to grow up there? Try to think this out for it is a very usual place for a town to grow and you will come across many more of them as you learn about other countries. *Delhi*, the capital of India about which you learnt in Chapter XIII; *Lahore*, the chief town of the West Punjab, and *Peshawar*, a frontier town guarding the North Western Passes. Then follow the line down the Indus valley to *Karachi*, its outlet port.

Then put in the line from *Bombay* to *Calcutta* which goes through the Narbuda valley and so into the Ganges plain.

The lines of the plateau are much easier to understand for there are so many less of them. First put the line from *Madras* to *Bombay* through *Poona* which is at the head of the pass through the Western Ghats. Then the line from *Madras* to the *West Coast* through the Palghat Gap. This passes through *Coimbatore* from which another line goes to *Mettupalayam*, a small town at the foot of the mountain railway which carries passengers to *Ootacamund*, the Hill Station of South India. This is a very wonderful piece of engineering and you should go to see it if you ever get the chance. Now put in the line from *Madras* to *Dhanushkodi*, which is the packet station for Ceylon, where passengers and goods have to be transferred from the train to the ferry boat to cross to Talaimanar and then transferred from the boat to the train for Colombo. Can you see why only a very small part of the trade between India and Ceylon goes this way? The mails and passengers use this route almost entirely but goods seldom. Think out the reason for yourselves.

One more main line is all that you must know, the one from *Madras* to *Calcutta* along the East Coast with the branch which goes off at *Vijayawada*, the town at the head of the Kistna delta, through *Nagpur* to *Delhi*. This is an important route for it links Madras with the capital of India.

The Trade of India and Pakistan. What are all these railways used for? We like to ride in a train sometimes to go to see our friends or to go for a holiday somewhere and we often think that the trains were really built for that purpose. This is a mistake for the chief work which they do is to carry goods from one place to another.

We talked about the great ports of Madras, Bombay and Calcutta, now let us see what kind of goods come in through the ports and go by means of the railways all over the country. The most important things which we import are manufactured goods of all kinds. Why? India is an agricultural country and although her manufactures are increasing she cannot make nearly enough for her great population to use. What are the chief things which she gets from abroad? Cotton to weave into cloth, and cloth which is already woven, forms a large share of her imports. Then machinery of all kinds, for there is very little iron to be found in India, so we cannot make all our own. Railway carriages and rails are needed for the many railways about which we spoke just now and smaller articles of metal like buckets and tubs for use in our homes. These are easy to understand. Another thing which we have to import in large quantities, is oil for our lamps. Where does it come from? The Middle East chiefly, and petrol, for driving all the buses and cars which we see now on our roads, comes with it. We import a large amount of sugar too for although we grow plenty of our own it is not enough for our large population.

How do we pay for all these things which are brought into our country? By exporting things in our turn. What kind of things do we send away? First of all raw cotton. We import it, then why should we send it away again? The kind of cotton which we import is the long-stapled cotton which does not grow readily in India and we send away to other countries the short stapled kind of which we have more than enough. Which port is likely to send out most of this product?

Jute and gunny bags come next in importance. From which port are they sent? Rice and wheat, oil seeds, which includes both coconut and groundnuts, tea and hides and skins are the chief things which we send away from our country. So you see that we tend to import manufactured goods and to export raw materials. Remember this, for it always happens with a country which is chiefly an agricultural one.

We have now studied the Geography of our own country and seen how the influence of climate and general geographical environment affects our activities. In your next Form at School you will learn about the rest of the world and how the same conditions influence other countries.

SUGGESTIONS FOR PRACTICAL WORK

1. Do the experiment with the taluk boundaries and the watersheds of the streams in your own taluk (suggested on page 144).
2. Trace a map of India or Pakistan on thin tracing paper and on it put the State boundaries. Place this over a physical map of the same scale and make a note of what you see.
3. Make the railway map suggested in the text.

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